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ORIGINAL ARTICLE

Analysis of indicators and factors influencing the development of entrepreneurship in the simulation of professional chess competitions using information technology

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ABSTRACT

The purpose of this research was to analyze the indicators and factors affecting the development of entrepreneurship in the simulation of professional chess competitions using Information Technology. The methodology was based on a mixed-methods approach with a descriptive-exploratory design. Accordingly, the influencing indicators were first identified through coding and subsequently presented using axial and selective coding. Furthermore, the validation and evaluation of these indicators among the studied population were conducted using Structural Equation Modeling (SEM). The statistical population of the study consisted of Information Technology experts and chess elites from scientific, technological, executive, and athletic fields. In the quantitative section of the research, the population included professional chess players active on online chess platforms and other similar digital environments. Data collection tools included semi-structured interviews for the modeling stage and a five-point Likert scale questionnaire for the validation stage, the validity of which was confirmed through convergent and divergent methods. The results of the qualitative analysis indicate that the development of entrepreneurship in the online chess ecosystem is a complex and multifaceted process influenced by various organizational, individual, and customer-oriented factors. Among these, technological features—including ease of access and application, learning capabilities, perceived benefits, and positive user experience—were identified as the fundamental pillars for creating a successful platform. The findings of this research generally indicate that entrepreneurial success in online chess requires a comprehensive approach. On one hand, technological infrastructure and sufficient financial resources are vital for their implementation and development. On the other hand, human factors, particularly the positive attitude of managers, the technical skills of employees, and their technological experience, play a key role in business adoption and growth. Finally, focusing on user needs, creating sustainable relationships with them, and receiving continuous feedback allow entrepreneurs to gain a sustainable competitive advantage and achieve sales growth and revenue generation through service innovation. These findings can serve as a valuable basis for policy-making and planning toward the sustainable development of entrepreneurship in this field.

KEYWORDS

Development, Entrepreneurship, Competition, Chess, Information Technology.



Introduction

Entrepreneurship is broadly recognized as a primary engine of economic growth, sustainable national development, and organizational competitiveness, playing a decisive role in employment creation and value generation (Farahani et al., 2019; Ansari Samani & Alizadeh Oujghaz, 2021). In recent years, the rapid diffusion of information technology and the consolidation of the digital economy have opened qualitatively new avenues for entrepreneurial activity, enabling innovative ventures to emerge around digital platforms in response to growing market demand (Maboudi Tamai et al., 2023; Mazidi et al., 2021). Contemporary evidence further demonstrates that emerging technologies can amplify innovation, expand opportunity spaces, and enhance economic performance across diverse sectors (Taleghani et al., 2023; Gracia-Zomeño et al., 2025). Within the sports industry, digital transformation has reshaped service delivery, user engagement, and revenue generation models in fundamental ways (Fard et al., 2021). Sport, as a dynamic and continuously expanding industry, possesses considerable latent capacity for entrepreneurship development, and the growth of digital sports platforms creates fertile ground for start-up ventures and competitive positioning (Liu et al., 2025). Among sport disciplines, intellectually strategic games such as chess are particularly suited to technology-driven development, owing to their data-intensive, analytically tractable nature and the high feasibility of competition simulation (Bidhendi & Shirdel, 2016; Taheri Torbati et al., 2023). Research examining the development of Iranian chess in an international context confirms that systematic, technology-supported approaches are indispensable for elevating this discipline's competitive standing (Ghaemmaghami et al., 2021). The recent proliferation of online chess platforms and the globalization of digital competitions signal that professional chess is progressively evolving toward the formation of a complex digital entrepreneurship ecosystem. Nevertheless, comprehensive, model-driven investigation of the factors governing entrepreneurship development in the context of professional chess competition simulation remains a substantive gap in the literature. The present study addresses this gap by systematically identifying and empirically validating the indicators and determinant factors of entrepreneurship development in the simulation of professional chess competitions using information technology, with the aim of providing a rigorous structural model capable of informing both policy and practice in this emerging domain.

Method

The study employed a sequential exploratory mixed-methods design, combining qualitative inquiry with quantitative model validation. Data collection proceeded across two distinct but interconnected phases. In the qualitative phase, the statistical population comprised experts and specialists in information technology and chess sport, drawn from the executive leadership of the Ministry of Sport and Youth, the Chess Federation, national and international coaches, talent development specialists, and academic faculty. Participants were selected through purposive and snowball sampling, and interviews continued until theoretical saturation was achieved, yielding a final sample of 16 participants (6 university faculty members and 10 senior managers and specialists). Semi-structured, in-depth interview questions were developed following a comprehensive review of the theoretical and empirical literature. Interviews were audio-recorded, transcribed verbatim, and subjected to multi-stage thematic analysis: open coding to identify initial concepts, axial coding to cluster concepts into categories, and selective coding to identify overarching themes. Test-retest reliability was calculated at 88%, confirming the stability and trustworthiness of the coding process. In the quantitative phase, a researcher-developed questionnaire employing a five-point Likert scale was administered to 235 professional chess players active on online platforms. Convergent validity was assessed through Average Variance Extracted (AVE) and factor loadings; discriminant validity was evaluated through the Fornell-Larcker criterion. Composite reliability (CR) values exceeded 0.70 for all constructs. All indicator factor loadings and t-statistics were significant at the 95% confidence level ($| \text{factor loading} | > 0.4$; $t > 1.96$). Structural model testing was conducted using PLS-SEM with SmartPLS software, reporting path coefficients, t-values, coefficients of determination (R^2), and the global model fit index (GOF).

Results

The qualitative thematic analysis produced 161 selective expressions, organized into 67 base themes, 20 organizing themes, and 7 overarching themes. The seven overarching themes are: (1) Organizational Factors; (2) Individual Factors; (3) Implementation of Entrepreneurship in Digital Chess; (4) Organizational Culture; (5) Organizational Structure; (6) Organizational Goals and Strategy; (7) Entrepreneurial and Customer Outcomes. Organizational Factors encompass two dimensions: Technology Characteristics of the Platform comprising ease of access and usability, learning capabilities, perceived technological advantages, and user technology experience and Organizational Resources comprising financial capital, information resources, technology-oriented human resources, and logistical support. Individual Factors are organized around Management-Level Characteristics including managerial attitude, innovation orientation, support behaviors,

and facilitative leadership and Technology Expertise of Personnel encompassing implementation skills, proficiency in advanced mechanisms, mental norms, and prior technology experience. The Implementation of Entrepreneurship in Digital Chess encompasses product and service development hardware infrastructure, software skills, role clarification, and feedback systems alongside user acquisition and retention through identification and segmentation of user needs. In the quantitative phase, all R^2 values for endogenous constructs were within acceptable ranges. The R^2 for "Implementation of Entrepreneurship in Digital Chess" was 0.578, and for Entrepreneurial Outcomes, 0.547. All path coefficients were statistically significant ($t > 1.96$). Organizational Factors exerted significant direct effects on Organizational Culture ($\beta = 0.296$, $t = 4.112$), Organizational Structure ($\beta = 0.393$, $t = 6.669$), and Organizational Goals and Strategy ($\beta = 0.366$, $t = 4.731$). Individual Factors showed significant effects on the same three mediating constructs ($\beta = 0.330$, 0.318 , and 0.229 respectively). Implementation of Entrepreneurship in Digital Chess demonstrated strong direct effects on Customer Outcomes ($\beta = 0.524$, $t = 9.168$) and Entrepreneurial Outcomes ($\beta = 0.390$, $t = 6.839$). The GOF index was 0.399, confirming good overall model fit.

Discussion and conclusion

The findings of this study demonstrate that entrepreneurship development within the online chess simulation ecosystem is a multidimensional process governed by the dynamic interaction of organizational, individual, and user-centric factors. The qualitative findings establish that technological platform characteristics including ease of access, learning affordances, perceived value, and positive user experience constitute the foundational pillars for platform success. This underscores that platform creation alone is insufficient; design must generate authentic value and an optimal user experience as prerequisites for viable entrepreneurial business models (Fard et al., 2021; Maboudi Tamai et al., 2023).

The quantitative findings corroborate and extend these insights. The substantial explanatory power of exogenous factors over the central construct ($R^2 = 0.578$) confirms the theoretical coherence and practical relevance of the proposed model. The strong direct effects of Implementation of Entrepreneurship in Digital Chess on both Customer Outcomes ($\beta = 0.524$) and Entrepreneurial Outcomes ($\beta = 0.390$) underscore that the quality of technology-driven platform execution is a critical determinant of both user-centered and business results. The further significant effect of Customer Outcomes on Entrepreneurial Outcomes ($\beta = 0.456$, $t = 8.928$) demonstrates that user satisfaction is a direct antecedent of entrepreneurial performance, consistent with evidence from the broader digital sports and competitive gaming literature (Liu et al., 2025). The present model contributes to the existing literature in several important respects. Prior research on chess development has predominantly focused on competitive, coaching, or cognitive dimensions (Ghaemmaghami et al., 2021; Hemmatizadeh et al., 2022), while neglecting the entrepreneurial and technological ecosystem perspective. This study demonstrates that cultural, structural, and strategic organizational factors alongside individual managerial and personnel competencies are equally determinative of information technology implementation success in this domain, a finding consistent with broader evidence on digital entrepreneurship (Mazidi et al., 2021; Parsa & Dalvi Isfahan, 2023). From a practical standpoint, successful entrepreneurship in digital chess demands a genuinely integrated approach. Robust technological infrastructure and adequate financial and specialist human resources are prerequisites for sustainable platform development (Farahani et al., 2019; Zivyar et al., 2017). An innovation-supportive leadership orientation combined with technically proficient and technologically experienced staff facilitates business adoption and organic growth (Torkashvand & Seraji, 2020). Deep knowledge of player needs, effective user acquisition and retention strategies, sustained community relationship management, and mechanisms for continuous feedback constitute the foundations of trust-building and durable competitive advantage (Farahani et al., 2015; Taleghani et al., 2023). The proposed model, validated through a rigorous mixed-methods approach, provides policymakers, federation administrators, platform developers, and entrepreneurial practitioners with an evidence-based roadmap for fostering sustainable entrepreneurship in the digital chess ecosystem. Future research should examine the longitudinal dynamics of this ecosystem, test the model's cross-national applicability, and investigate the moderating roles of cultural and regulatory contexts on entrepreneurial outcomes in digital sports environments.

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Authors' Contribution

The sole author was responsible for the study's conceptualization, methodology, data collection, analysis, writing, and final approval of the manuscript.

Conflict of Interest

The author declares no conflict of interest regarding the publication of this article.

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