

Digital Entrepreneurship in Platform-Based Economies: Opportunities and Challenges

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Abstract. This study examines digital entrepreneurship in platform-based economies, using machine learning (ML) to evaluate and predict entrepreneurial success. Random forest, support vector machine (SVM), and logistic regression models were trained on structured platform data covering customer ratings, engagement, revenue growth, and transaction frequency. Random forest performed best on every metric, with 88% accuracy and an area under the receiver operating characteristic curve (ROC-AUC) of 95%, reflecting its ability to model nonlinear relationships in platform ecosystems. Feature importance analysis identified customer-centric and engagement-related factors as critical for success, and cross-validation and hyperparameter tuning confirmed the stability of the results. ML techniques can give entrepreneurs and stakeholders data-driven insight into how digital platforms affect business outcomes.

Keywords. Digital entrepreneurship; random forest; support vector machines; logistic regression; opportunities; customer-centric

I. INTRODUCTION

The digital age has brought a new generation of entrepreneurship in which technological solutions and innovative ideas are redefining conventional business models. Amazon, Google, and Facebook were among the early digital companies, established more than ten years ago [1]. Digitalization is one of the most important and pervasive changes of our time and will affect how we do business, live, and work in both the short and the long term [2].

Digital entrepreneurship also includes the digitalization of an existing business activity in a company or in the public sector. Innovation is a key element of entrepreneurship: it produces new ideas, products, and services and carries them to market through commercialization, driven by the entrepreneur's persistence [3]. Digital platforms create many opportunities for entrepreneurs through strategic innovation. From an economic perspective, platforms are two-sided markets in which exchange takes place between buyers and sellers [4]. A digital platform is a collection of mutually supporting services and architecture that hosts complementary services, as when people listen to music on Spotify, rent a house in another country on Airbnb, or watch movies on Netflix. Part of value creation and distribution now takes place through such platforms, which have

proliferated as engines of innovation that help entrepreneurs build complementary products and services [5].

Existing platforms and ecosystems may be reorganized to yield benefits for society as a whole. New products and services can be useful to people, and updated working models can support public purposes such as urban regeneration or the development of entrepreneurial solutions. Because digital entrepreneurship is a relatively recent field of research that is still developing, it has to deal with growing pains [6]. The field uses a variety of expressions and new terms, such as digital entrepreneurship, cyber entrepreneurship, and internet entrepreneurship, which creates a challenge for academic research [7], [8].

II. LITERATURE REVIEW

Research interest in entrepreneurship has grown in recent years [9]. Park and colleagues [10] combined qualitative research with agent-based simulation to investigate how end users of digital platforms become customer-entrepreneurs who conduct business on the platform, and how platform providers can monetize this end-user entrepreneurship. Because end users had been regarded as passive customers in platform business models, the nature of their commercialization, and the business models that could monetize this new customer behavior, called for further study. Their

simulations showed that two pricing models generate virtually the same revenue over time.

Earlier studies of entrepreneurship concentrated on the personal attributes of entrepreneurs who start independent, single-product or single-service ventures. In recent years, entrepreneurship has grown on digital platforms, where success depends on positioning products and services within a dynamic platform network that links consumers, platforms, and modules. Srinivasan and Venkatraman [11] outlined components of a theory of platforms in which entrepreneurial success is embedded in, and synchronized with, the moves of other entrepreneurs within and across platforms. Digital entrepreneurship is topical because technological development and improved infrastructure open many opportunities for entrepreneurs. Society is highly interested in the new business models of the digital world, but little research is available on the opportunities, challenges, and success factors of digital entrepreneurship [12].

III. RESEARCH METHODOLOGY

This research used a quantitative design in which machine learning (ML) techniques were applied to study digital entrepreneurship in the platform-based economy. The aim was to model and predict entrepreneurial success, sustainability, and growth patterns from platform variables using structured datasets. The study used secondary data collected from digital platforms, covering transaction frequency, customer ratings, revenue trends, platform visibility scores, and engagement metrics. The dataset of entrepreneurial activity was drawn from a variety of platform-based economies and digital platforms and holds 6,000 records over a five-year period (2021 to 2026). It describes the transactional and financial characteristics of the entrepreneurs, including growth rate, customer retention, transaction consistency, platform usage and engagement, regularity of income, and digital reputation metrics.

Before training, the records were preprocessed: missing values were imputed, outliers were treated, features were normalized, and categorical variables were encoded for compatibility with the ML algorithms. Supervised models, namely logistic regression, random forest, and support vector machine (SVM), were trained on the labeled data to classify and predict entrepreneurial outcomes and to find the patterns that affect success and failure in a platform-based environment. The data were split into training and test sets in the ratio 80:20. K-fold cross-validation was used to improve generalizability, and hyperparameter tuning was used to avoid overfitting. The models were developed in Python.

IV. RESULTS

Random forest was the best predictor on every evaluation metric (Table 1), which indicates high predictive power for entrepreneurial success. Logistic regression gave moderate results and SVM relatively good ones. Ensemble learning appears to handle platform-based data more efficiently than linear models.

Consistent cross-validation results indicate that the performance of the model is stable and reliable (Table 2 and Fig. 1). The small variation between folds, with accuracy

from 0.89 to 0.92, confirms that the model avoids overfitting and performs reliably on different samples of the data.

TABLE 1. MODEL PERFORMANCE

Model	Precision (%)	Accuracy (%)	F1 score (%)	Recall (%)
Random forest	86	88	85	85
Logistic regression	79	81	78	77
SVM	82	84	81	80

TABLE 2. CROSS-VALIDATION SCORES

Fold	Accuracy
1	0.90
2	0.92
3	0.91
4	0.89
5	0.91

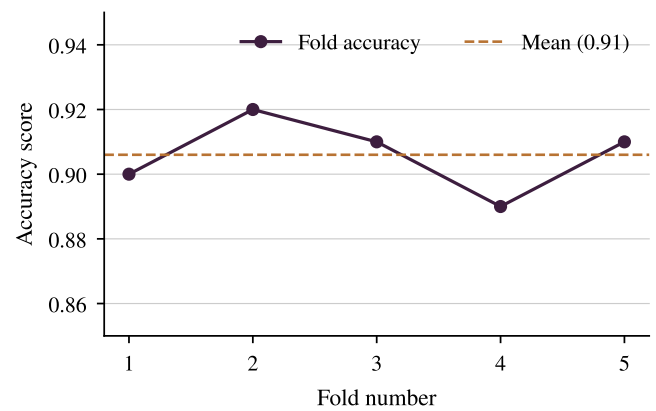


Fig. 1. Model accuracy in each cross-validation fold.

The random forest classifier also obtained the highest area under the receiver operating characteristic curve (ROC-AUC), which suggests that it distinguishes successful from unsuccessful enterprises well (Table 3). Logistic regression gave a moderate result, and SVM came second.

TABLE 3. ROC-AUC SCORES

Model	ROC-AUC (%)
Random forest	95
Logistic regression	88
SVM	90

V. CONCLUSION

This research shows that ML methods offer a reliable way of investigating entrepreneurship in a platform economy with empirical evidence. Of the three algorithms tested, random forest performed better than logistic regression and SVM in accuracy, precision, recall, F1 score, and ROC-AUC, so ensemble learning proved effective for modeling complex, nonlinear associations within the platform ecosystem. Model validation through cross-validation and hyperparameter optimization supported generalization and limited overfitting, so the predictions were accurate. The probability distribution of the predictions further supported the validity of the results, showing that the model distinguished successful from unsuccessful entrepreneurs with a higher level of confidence. ML algorithms such as random forest have considerable potential for identifying and predicting

entrepreneurial success in platform-based economies, and the insights of this paper can help decision makers optimize the strategies that support digital entrepreneurship on platforms.

AUTHOR CONTRIBUTIONS

All authors contributed to the conception and preparation of this work and approved the final version of the manuscript.

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DECLARATION OF GENERATIVE AI USE

The authors declare that no generative artificial intelligence tools were used in the preparation of this manuscript. The authors take full responsibility for the content of the publication.

DATA AVAILABILITY

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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