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Research Paper

Optimization of behavioral indicators of entrepreneurial performance in technology-based startups

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Abstract

The aim of the present study is to optimize the behavioral indicators of entrepreneurial performance in technology-based startups. The research method of this study is a mixture (qualitative-quantitative) of the meta-synthesis method in the qualitative part and the decision tree and genetic algorithm in the quantitative part. For this purpose, the meta-synthesis method has been used to examine and identify the dimensions and influential factors, in which regard the research population is 164 valid scientific articles published between 2013 and 2023, after specialized filtering and quality control of the texts, 38 articles were selected for analysis and coding. Next, the meta-heuristic algorithm was used to optimize the identified indicators. For this purpose, in the meta-heuristic algorithm section, the genetic algorithm was used for its optimal modeling because it was the best method for optimizing this research according to experts. The findings showed that in the qualitative section, we obtained 97 open codes and 18 closed codes, which were categorized into four categories: entrepreneurial structural factors, entrepreneurial behavioral factors, entrepreneurial capital factors, and entrepreneurial external factors. In the quantitative section, for the indicators, it shows that the indicators of government programs, entrepreneurship education in elementary schools, entrepreneurship education after school, and finally business and professional infrastructure have the greatest impact on the classification of countries, respectively, and to improve the status of entrepreneurs and the ranking of countries, special focus should be placed on these four areas.

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Extended Abstract

Introduction

Entrepreneurship is recognized as one of the key factors in economic growth and development, and technology-based startups play an important role in improving the economic situation due to innovation and job creation. Optimizing the performance of these startups can help increase productivity and competitiveness in the market. Startups usually face numerous challenges such as lack of financial resources, lack of management experience, and inability to attract customers. Optimizing behavioral indicators can help identify and solve these challenges and allow startups to perform better. Given today's competitive conditions in the world and the key and fundamental role of new businesses and startups, in fact, the requirement for survival in the current competitive environment and saturated markets is not only to attract and satisfy customers, but also to build long-term relationships with them. With the increasing and rapid increase in global developments and the transition from a traditional society to an information society, attention to new strategies for optimal use of new strengths, opportunities, and values has forced organizations and business companies to transform more than ever before, and today, the tendency to entrepreneurship is considered one of the new strategies in organizations, both public and private. Various studies have identified different factors as factors affecting entrepreneurial performance, some of which will be mentioned in the background section below. In this study, we first examine all the components and factors affecting entrepreneurial performance and seek a method to optimize the analyzed big data resulting from entrepreneurial performance using a meta-heuristic algorithm.

Background

Technology-based startups refer to new companies that offer products or services using new technologies. These types of startups usually operate in various fields, including software, hardware, the Internet, and information technology, and their goal is to create innovation and improve existing processes and products in the market (Lee et al, 2023). Technology-based startups usually focus on rapid growth and scalability and seek to attract investment to develop products and expand their market. Given global trends, it can be expected that technology-based startups will increasingly tend towards intelligent processes and automation, data optimization, and personalized service provision (Safitri et al, 2023). Today, technology-based startups face several challenges, including fierce competition, the need for constant innovation, and a precise understanding of the target market. Also, issues related to privacy and digital ethics have become new problems in this industry. However, as technology continues to develop and global markets expand, there is great potential for these startups in the future. Technology-driven startups, as one of the most important and influential sectors of the modern economy, are noteworthy and analyzed globally due to their innovation, entrepreneurship, and creation of new values. These startups bring numerous benefits and advantages to society, the economy, and even the environment by utilizing new technologies. In the following, the benefits of technology-driven startups are examined and each one is tried to be explained in detail (Santisteban et al, 2023). Innovation and process improvement: Technology-driven startups help generate innovative ideas and solutions that can optimize existing processes. These innovations can include new software, artificial intelligence algorithms, or creative hardware that help improve the quality of services and products. Startups are known as engines of job creation. Such businesses not only help recruit new workers but can also lead to job growth in related industries. Despite their great potential, technology-based startups face numerous obstacles and challenges that can affect their growth and development. One of the most important obstacles is the lack of access to sufficient financial resources. These startups need initial investment and financial support to develop their products and services and

introduce them to the market. In many cases, finding investors who trust promising ideas is difficult, and startups may face delays and various challenges in attracting investors (Prasetio et al, 2020).

Method

The mixed research in this study is of the exploratory type. In this study, considering that the mixed research design is of the exploratory type, quantitative and qualitative data are combined using the data connection method, that is, connecting two data sets in a way that builds one on top of the other. The analysis tool is meta-synthesis, and in the second part of the present study, optimization is performed using the meta-heuristic algorithm and using the MATLAB statistical software. This study was conducted by searching for the keywords "entrepreneurial performance" and focusing on articles published between 2013 and 2023. The result of this effort led to the selection of 38 articles, including 24 foreign articles and 14 domestic articles. All of these articles were repeatedly studied and reviewed, and in this process, coding was performed. In addition, irrelevant and inappropriate codes were identified and eliminated, ultimately leading to a comprehensive and relevant set of data. From the obtained materials and results, 97 distinct concepts were extracted and these concepts were categorized based on their semantic distinction and specific features. In order to assess the reliability of these concepts, two experts in the relevant field were used and their agreement was measured through Cohen's kappa coefficient. In the quantitative part of this research, process optimization was carried out using metaheuristic algorithms and decision trees. This part of the research was carried out using MATLAB statistical software.

Results

In the meta-synthesis section, 164 articles were collected, studied and reviewed. To increase the validity of the research, articles with low validity, i.e. based on the average number of references to articles per year and articles that had less than 7 references per year compared to the years under study, were eliminated. The Google scientific search engine was used to find the number of references. Finally, 38 articles were consistent with the research objective, of which 24 were foreign articles and 14 were domestic articles. In order to search for the mentioned items, taking into account the search parameters mentioned in the previous sections, pre-determined keywords were searched in reputable databases. In this study, 4 components of entrepreneurial external factors, entrepreneurial structural factors, entrepreneurial capital factors and entrepreneurial behavioral factors were extracted. To better understand the indicators of Iran's situation, it is necessary to compare Iran's indicators with other countries in the world, so in the first step, the data was pre-processed. After removing defective data, the indicators were normalized. In order to normalize the data, we divided each indicator by its historical value in that year and then took the sum of the normalized indicators as the ranking criterion. We placed the countries with the lowest 20% of the normalized indicators in one class and considered them as very unfavorable countries in the field of entrepreneurship. We named the next 20% as the class of countries with an unfavorable situation in the field of entrepreneurship. We placed the next 20% as the class of average countries in the field of entrepreneurship, the next 20% as the class of favorable countries, and the 20% of countries with the highest value as countries with a very favorable situation in the field of entrepreneurship. The Iran status score from 2014 to 2013 showed that in this 10-year period, Iran had an unfavorable situation only in 2020 and in the remaining years, Iran was in the class of very unfavorable countries in the field of entrepreneurship.

Discussion

Thc point of Iran's situation from 2014 to 2013 showcd that in this 10-ycar pcriod, Iran had an unfavorable situation only in 2020, and in the remaining years, Iran is in the class of very unfavorable

countries in the field of entrepreneurship. The trend of changes in Iran's indicators compared to other countries in the world shows that in 2015, the trend of changes in entrepreneurial indicators in Iran was upward, and in 2016, the indicators decreased, and with the exception of 2019, from 2016 to 2020, the trend of changes in indicators was positive and increasing, and from 2020 to 2023, the entrepreneurship indicators declined sharply, so that in 2023 they reached their lowest value in the 10 years analyzed. In the next step, in this thesis, a decision tree was used to enumerate the rules governing the classification of countries and obtain effective indicators in the field of entrepreneurship, and a genetic algorithm was used to optimize it, and finally, with the aim of better understanding the rules and reducing them, an optimal pruned decision tree was designed using a genetic algorithm. For the indicators, it shows that indicators 3, 4, 5 and 7 have the greatest impact on the classification of countries, and to improve the status of entrepreneurs and the ranking of countries, special focus should be placed on these four areas. These areas are as follows in order of importance:

1) The existence of property rights, commercial, accounting and other legal services and the evaluation of institutions that support or promote SEMs.

2) The extent to which training in the creation or management of SEMs is included in the education system at the primary and secondary levels.

3) The existence of quality direct assistance programs for SEMs at the government levels (national, regional and urban).

4) The extent to which training in the creation and management of SEMs is included in the higher education system. It should be noted that using the optimized decision tree, it is possible to predict how Iran's situation will change in 5 classes: very unfavorable, unfavorable, average, favorable and very favorable if the indicators change.