

# The role of environmental innovations in entrepreneurship: A case study of EcoShine

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**Received** 09/11/2024

**Accepted** 23/12/2024

## Abstract

This study aims to examine the role of environmental innovations in entrepreneurship, focusing on the case study of the EcoShine Company. Recognized as a leading firm in eco-friendly products and services, EcoShine is explored in depth regarding its business model and environmental innovations. The findings indicate that environmental innovations have been a key driver of EcoShine's entrepreneurial success. These innovations have not only contributed to the company's competitive advantage but also played a significant role in sustainable development and environmental protection. Moreover, the study delves into the challenges and opportunities faced by innovative companies in the environmental domain and provides recommendations to enhance the role of environmental innovations in entrepreneurship.

**Keywords:** environmental innovation, entrepreneurship, case study, EcoShine, sustainable development

## Introduction

In the modern era, entrepreneurship and innovation play unparalleled roles as the driving forces of economic and social development. Leading global economies increasingly emphasize technological innovations and entrepreneurial creativity. These innovations not only create new job opportunities and enhance productivity but also

improve quality of life and address global challenges. Among these, inventions stand out as a critical indicator in the innovation and entrepreneurship process. They can bring transformative changes across various industries and pave the way for the emergence and expansion of innovative businesses. (1)

One such invention that has recently garnered significant attention is "EcoShine." Developed by Sadegh Karimi Masouleh, EcoShine is recognized as an innovative system for illuminating intercity roads. Utilizing advanced engineering principles and innovations, EcoShine provides essential road lighting without relying on conventional energy sources such as electricity or fossil fuels. This system is not only economically viable but also environmentally sustainable, offering a nature-friendly solution by reducing energy consumption and protecting the environment. (2)

EcoShine has received numerous international awards and accolades for its environmental and economic benefits. These include the gold medal at the World Invention Competition in Erasmus, Netherlands; the gold medal at the World Invention Competition in the USA; and the gold medal at the World Invention Competition in South Korea. These achievements underscore the high potential of this invention at a global level and its ability to make a positive impact on diverse communities. (2)

Considering the significance of inventions and innovations in fostering entrepreneurship and the potential of inventions like EcoShine to establish and expand new businesses, this study investigates the role and impact of this specific invention on entrepreneurship development in Iran. With a creative workforce and abundant natural resources, Iran possesses considerable potential for fostering entrepreneurship and innovation. However, challenges such as inadequate infrastructure, legal and economic constraints, and cultural and social issues remain barriers that can hinder entrepreneurship development in the country. (2)

The primary goal of this research is to analyze the role of innovation in improving entrepreneurial processes, identify challenges and opportunities created by inventions like EcoShine, and assess its economic and environmental impacts. By studying this case, the research seeks to gain a deeper understanding of the influence of innovation on entrepreneurship in Iran and offer strategies for enhancing and strengthening innovative processes in the country. (2)

To achieve this, the present study addresses three main questions:

1. How has the invention "EcoShine" influenced entrepreneurial processes in Iran?
2. What challenges and opportunities has this invention created for entrepreneurs and innovative businesses?
3. What economic and environmental impacts of this invention are evident in Iranian society and economy?

To answer these questions, a mixed-methods approach will be employed, encompassing both quantitative and qualitative data collection and analysis. The quantitative component involves statistical analysis of data gathered through surveys and questionnaires. The qualitative component includes semi-structured interviews with entrepreneurs, experts, and specialists in the fields of innovation and invention to gain deeper insights into the effects of inventions and innovations on entrepreneurship development. (2)

Given its multifaceted nature, this research can serve as a valuable resource for policymakers, entrepreneurs, and researchers in the fields of innovation and entrepreneurship. With rapid changes in technology and the growing need for innovative solutions to complex social and economic issues, the findings of this study can provide useful guidance for developing entrepreneurship policies and strategies in Iran.

Overall, innovation and invention serve as pivotal factors in the entrepreneurial process, playing a crucial role in the formation and development of innovative businesses. By examining the case of the EcoShine invention and analyzing its impacts on entrepreneurship in Iran, this study aims to enhance the understanding of innovation and entrepreneurship processes in the country and contribute to sustainable development and economic growth. By offering solutions to improve entrepreneurship and innovation processes, this research strives to strengthen Iran's entrepreneurial ecosystem and pave the way for the advancement of inventions and innovations.

## **Literature Review**

### **1. Entrepreneurship: Concepts and Definitions**

Entrepreneurship is defined as the process of identifying, evaluating, and exploiting business opportunities. Over time, this concept has evolved and is now recognized as one of the most critical drivers of economic and social development worldwide. Entrepreneurship not only contributes to job creation and economic growth but also promotes innovation and improves industrial processes. According to classical definitions, an entrepreneur is an individual who takes risks and innovates to create economic value by establishing and managing new businesses. (3)

In the entrepreneurship literature, various factors have been identified as key components of success in this field. These include innovation, risk-taking, resource management, and the ability to capitalize on opportunities. As a pioneer in entrepreneurship theories, Schumpeter introduced innovation as the essence of entrepreneurship, emphasizing that entrepreneurs drive economic development by transforming production processes or introducing new products. (4)

### **2. Innovation: Its Role and Importance in Entrepreneurship**

Innovation is the process of introducing new ideas and transforming them into products, services, or processes that can significantly enhance business and economic performance. Innovation plays a crucial role in entrepreneurship and is considered one of the most important factors for the survival and growth of startups. Successful innovations enable entrepreneurs to achieve sustainable competitive advantages and stand out in competitive markets. (5)

In the literature on innovation, various types have been identified, including product innovation, process innovation, and organizational innovation. Product innovations refer to the introduction of new or improved products, while process innovations involve enhancements in production methods or service delivery. Organizational innovations relate to changes in structures and management practices within organizations. (6)

### **3. Invention and Innovation: Differences and Interconnections**

Invention and innovation are interrelated concepts often mistakenly used interchangeably. Invention refers to the creation or discovery of a new idea or technology that did not previously exist. While inventions can serve as the foundation for innovations, innovation involves the commercialization and utilization of these ideas or technologies to generate economic value. (7)

In the entrepreneurial process, inventions play a vital role as they can provide new opportunities for entrepreneurs. However, merely having an invention is not enough. Entrepreneurs must be able to transform inventions into products or services that succeed in the market. In other words, innovation is the process through which inventions are turned into commercial realities. (8)

#### **4. Case Study: EcoShine – The Role of Invention in Entrepreneurship**

The invention of "EcoShine," developed by Sadegh Karimi Masouleh, is a prominent example of the impact of inventions on entrepreneurship. This system, which provides intercity road lighting without relying on conventional energy sources, has garnered multiple international awards for its environmental and economic advantages. EcoShine exemplifies an invention that is not only technologically innovative but also commercially successful, with positive effects on both the economy and the environment. (2)

This invention demonstrates how technological innovations can lead to the creation of successful new businesses. By offering a sustainable and cost-effective solution for road lighting, EcoShine has attracted the attention of entrepreneurs and investors, positioning itself as a successful example of the fusion of innovation and entrepreneurship. (2)

#### **5. The Impact of Inventions and Innovations on Economic Development**

Inventions and innovations are recognized as the driving engines of economic development. They can enhance productivity, create new job opportunities, and increase industrial competitiveness. (9), Research shows that countries investing heavily in research and development (R&D) and innovation typically experience higher economic growth rates. (10)

In economic literature, innovations are identified as key factors in enhancing national competitiveness and expanding global market share. Specifically, technological innovations can reduce production costs, improve product quality, and increase efficiency in production processes. These advancements, in turn, boost exports and attract foreign investments. (11)

## **6. Challenges of Innovation and Entrepreneurship in Iran**

Despite Iran's high potential for innovation and entrepreneurship, numerous challenges persist in this domain. One of the most significant challenges is the lack of adequate infrastructure to support innovation and entrepreneurship. Technological infrastructure, financial systems, and supportive laws and regulations are among the factors that can influence the development of entrepreneurship. Moreover, cultural and social issues can also pose barriers to innovation and entrepreneurship in Iran. (12)

Economic issues play a critical role as well. High inflation rates, economic instability, and limited access to financial resources are factors that negatively impact entrepreneurs' motivation to innovate. Additionally, restrictions on access to international markets and trade limitations can present challenges in the commercialization of innovations. (12)

## **7. Strategies for Strengthening Innovation and Entrepreneurship in Iran**

To enhance innovation and entrepreneurship in Iran, policymakers and decision-makers need to implement a set of strategic measures. These include reforming technological infrastructure and research and development systems, creating supportive legal and economic environments, and strengthening financial and investment systems. Establishing venture capital funds and facilitating entrepreneurs' access to financial resources can play a critical role in this regard. (13)

Increasing international collaboration and exchanging knowledge and technology with leading countries can also contribute to the development of innovation and entrepreneurship in Iran. (14), Building innovation networks, fostering industry-academia linkages, and establishing incubators and science and technology parks are

among the strategies that can strengthen Iran's entrepreneurial and innovation ecosystem. (15)

## **Theoretical Framework of the Research**

The theoretical framework of this research serves as a foundation for analyzing and interpreting its findings and results. This framework is based on theories of entrepreneurship, innovation, and economic development, which are explored in detail below.

### **3.1. Entrepreneurship Theory**

Entrepreneurship is recognized as one of the most critical drivers of economic and social development. Theories of entrepreneurship are generally categorized into two groups: economic theories and behavioral theories. Economic theories examine the role of entrepreneurship in creating economic value, generating employment, and enhancing productivity. Behavioral theories, on the other hand, explore the personal and behavioral traits of entrepreneurs, such as risk-taking, innovation, and creativity. (16)

This research adopts both perspectives. On one hand, it examines how the EcoShine invention, as a technological innovation, has created entrepreneurial opportunities in Iran. (2), On the other hand, it investigates the behavioral characteristics of entrepreneurs who have leveraged this invention.

### **3.2. Innovation Theory**

Innovation is defined as the process of introducing new ideas and transforming them into new products, services, or processes that can significantly improve business and economic performance. Innovation theory explores the role of innovation in creating economic value, improving productivity, and enhancing industrial competitiveness. (17)

In this research, innovation is analyzed as a key factor in the success of the EcoShine invention. Innovation theory demonstrates that technological innovations can help achieve sustainable competitive advantages and bring substantial improvements to businesses and industries. This study aims to show how the EcoShine invention, as a

technological innovation, has contributed to entrepreneurship development and increased Iran's competitiveness. (2)

### **3.3. Economic Development Theory**

Economic development is defined as a process that leads to improvements in a country's economic and social conditions. Economic development theories examine the factors that contribute to economic growth, poverty reduction, and social welfare enhancement, with innovation and entrepreneurship being among the most critical factors. (18)

This research uses economic development theories to analyze the impact of the EcoShine invention on Iran's economic development. It investigates how this invention, by reducing operational costs, increasing productivity, and attracting new investments, has contributed to economic growth and sustainable development in Iran. (2)

### **3.4. Competitiveness Theory**

Competitiveness refers to a country's or organization's ability to maintain and expand its share in global markets. (19), Competitiveness theories explore factors that enhance the competitive strength of nations and organizations, including technological innovations, product and service quality, and productivity. (20)

This research utilizes competitiveness theory to analyze the impact of the EcoShine invention on Iran's competitive capabilities in global markets. It highlights how this invention, through winning international awards and increasing global recognition of Iran's innovative potential, has boosted the country's national competitiveness. (2)

## **Research Methodology**

This research adopts a descriptive-analytical and survey-based approach. The target population comprises two main groups:

### **a) Entrepreneurs and business owners in renewable energy and energy management sectors in Iran:**

This group includes individuals who have directly or indirectly used the "EcoShine" invention or work in sectors where this invention could have an impact.



**b) Experts and researchers in innovation and entrepreneurship:**

This group consists of individuals involved in innovation, entrepreneurship, and economic development who can provide specialized insights into the impact of the EcoShine invention.

To select appropriate samples from the target population, a multi-stage cluster sampling method is employed.

The primary data collection tool is a questionnaire:

The questionnaire serves as the main tool for collecting data in the quantitative section of the research. It includes questions designed to assess the key variables of the study, such as the impact of the EcoShine invention on entrepreneurial activities, productivity, and competitiveness. The questionnaire contains both closed (multiple-choice) and open (descriptive) questions to facilitate the collection of both qualitative and quantitative data. (21)

Quantitative data collected through the questionnaires are analyzed using statistical software such as SPSS. This analysis focuses on examining key variables, including the impact of the "EcoShine" invention on productivity, entrepreneurship, and competitiveness.

**Descriptive Findings:**

**Table 1. Descriptive Findings of the Research Variables**

<b>Variables</b>	<b>Item</b>	<b>Time</b>	<b>Mean</b>	<b>Standard Deviation</b>
Entrepreneurial Activities	3	Before EcoShine Invention	7.66	1.77
		After EcoShine Invention	10.84	2.49
Operational Costs	2	Before EcoShine Invention	7.04	1.57

Variables	Item	Time	Mean	Standard Deviation
		After EcoShine Invention	5.18	1.52
Energy Management Efficiency	3	Before EcoShine Invention	6.70	1.64
		After EcoShine Invention	9.73	2.48
Competitiveness	3	Before EcoShine Invention	7.56	2.53
		After EcoShine Invention	10.33	2.80

To test the normality of the data, skewness and kurtosis coefficients were used, with the results shown in the table below:

**Table 2. Normality Test of the Data**

Variables	Entrepreneurial Activities	Operational Costs	Energy Management Efficiency	Competitiveness
Skewness	-0.768	1.163	-0.635	-0.346
Kurtosis	0.190	1.068	0.620	-0.750

Since the skewness and kurtosis values are within the range of (-2, +2), the data distribution is normal, and parametric tests can be used.

#### 4.4 Hypothesis Testing

For analyzing the collected data, a paired sample t-test was used.

**Table 3. Hypothesis Test Results**

	Mean Difference	Standard Deviation	Lower Bound	Upper Bound	T	Sig. Level
Pair 1: Entrepreneurial Activities Before and After EcoShine	-3.180	0.254	-3.683	-2.676	-12.476	0.000
Pair 2: Operational Costs Before and After EcoShine	1.853	0.113	1.628	2.077	16.305	0.000
Pair 3: Energy Management Efficiency Before and After EcoShine	-3.026	0.247	-3.516	-2.536	-12.208	0.000
Pair 4: Competitiveness Before and After EcoShine	-2.773	0.187	-3.143	-2.403	-14.824	0.000

**First Hypothesis:** EcoShine invention has led to an increase in entrepreneurial activities in the renewable energy sector in Iran. Since the significance level of t-value (-12.476) is less than the 0.05 error level, it can be concluded that there is a significant difference in entrepreneurial activities in the renewable energy sector in Iran before and after EcoShine. Also, because the mean difference and the upper and lower bounds are negative, it can be concluded that entrepreneurial activities in this sector increased after EcoShine. Thus, the hypothesis is confirmed with a 95% confidence level.

**Second Hypothesis:** EcoShine invention has reduced operational costs and improved energy management efficiency on intercity roads in Iran. Since the significance level of t-value (16.305) is less than 0.05, it can be concluded that there is a significant difference in operational costs on intercity roads in Iran before and after EcoShine. Moreover, the mean difference and the upper and lower bounds are positive, indicating that operational costs decreased after EcoShine. Similarly, with the significance level of t-value (-12.208) being less than 0.05, it can be concluded that energy management efficiency improved on intercity roads in Iran after EcoShine. Therefore, the hypothesis is confirmed with a 95% confidence level.

**Third Hypothesis:** EcoShine invention has increased Iran's competitiveness in global innovation and inventions markets. Since the significance level of t-value (-14.824) is less than 0.05, it can be concluded that there is a significant difference in Iran's competitiveness in global innovation and inventions markets before and after EcoShine. Furthermore, the mean difference and the upper and lower bounds are negative, indicating that Iran's competitiveness in these

markets increased after EcoShine. Thus, the hypothesis is confirmed with a 95% confidence level.

## Conclusion

This research aimed to investigate the impact of invention and innovation on entrepreneurship development, with a case study on the "EcoShine" invention. The results showed that innovative inventions, especially in the fields related to renewable energy and the environment, play a significant role in stimulating and accelerating entrepreneurship processes. The "EcoShine" invention, as a successful example of such innovations, has provided a new and efficient solution for street lighting on intercity roads without the need for external energy sources, addressing an important issue in transportation infrastructure while also serving as an economic driver for renewable energy-related businesses.

The data analysis revealed that EcoShine, by reducing energy costs and improving efficiency, has increased competitiveness among related businesses and created opportunities for the development of new products and services. Moreover, due to its environmental aspects, it has stimulated investment in green and sustainable sectors, highlighting the importance of environmentally compatible innovations in driving entrepreneurship trends and creating new economic opportunities.

Additionally, the results of both qualitative and quantitative analyses indicated that technological innovations like EcoShine not only improve economic performance but can also have positive social and cultural impacts. These innovations raise awareness about environmental protection and energy consumption reduction, leading to shifts in societal attitudes and behaviors and acting as a catalyst for transforming policies and strategies for sustainable development.

## Recommendations

Based on the findings, several recommendations are provided for strengthening and further developing innovations and entrepreneurship in the country:

1. **Support for Environmental and Sustainable Innovations:** The government and relevant organizations should provide more support for technological innovations with an environmental focus, such as EcoShine. This support can include financial incentives, tax exemptions, and necessary infrastructure for the development and commercialization of such inventions. Additionally, establishing investment funds for supporting startups in this field can accelerate entrepreneurship development.

2. **Promotion of Innovation and Entrepreneurship Culture:** To enhance innovation and entrepreneurship, a culture of innovation must be promoted within society. This can be achieved through specialized education, workshops, and the establishment of supportive networks among entrepreneurs and innovators. Competitions and exhibitions focused on environmental innovations can help identify and encourage new talents.
3. **Improvement of Legal and Regulatory Infrastructure:** Creating and strengthening legal frameworks to support intellectual property and patent registration can motivate innovators and entrepreneurs. Simplifying patent registration processes and protecting intellectual property rights through clear and efficient laws can lead to more innovations and the development of new products.
4. **Strengthening International Cooperation:** Given the globalization of markets and the importance of international innovations, strengthening international cooperation in innovation and entrepreneurship is essential. Creating opportunities for knowledge and technology exchange with other countries, particularly in renewable energy and environmental sectors, can improve innovative processes in the country.
5. **Providing Financial and Credit Incentives:** Offering financial incentives such as low-interest loans, grants, and credit facilities for businesses involved in technological and environmental innovations can promote these types of businesses. Additionally, creating support programs to reduce the financial risks associated with innovation and entrepreneurship can further incentivize investment in this field.
6. **Raising Public Awareness about Innovations and Their Impacts:** Public awareness campaigns on the importance of innovations, especially those related to the environment, can increase demand for innovative products and services. This can be done through mass media, social networks, and educational programs.

Ultimately, by implementing these recommendations and utilizing the research results, innovation and entrepreneurship in the country can be enhanced, and the potential of various sectors can be harnessed to bring about positive economic and social transformations. The EcoShine invention, as a successful example, demonstrates the untapped potential that, with proper support and guidance, can turn into engines of economic growth and sustainable development.

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