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Developing Small Innovative Enterprises (SIE) by using Triple Helix Model

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ABSTRACT

There is no universal law for realizing the contribution of universities in the development of regional innovation systems. Much depends on the context of the country, resources of a particular region and socio-cultural characteristics. This paper examines the impact of the triple helix model on the development of small innovative enterprises (SIE). The main goal of the research is to identify the role of cooperation between universities, industry and government in the development of small innovative companies. Using the descriptive and analytical method, data was collected from 50 small innovative companies in Tehran province, and a random sample of 10 companies was selected, and the data was completed through standard questionnaires and semi-structured interviews with 30 specialists and academic experts, and the data analysis was done using SPSS software was used and the results showed that effective collaboration and the use of technology significantly affect the development of innovation. The strong positive correlation between these variables (r = 0.845 and r = 0.873, respectively) indicates the importance of interactions between institutions in increasing innovation capabilities. Also, the findings indicate that the research and development budget does not have a direct effect on innovation, but cooperation with universities and the use of technology are the keys to success in this field. This paper advises policymakers and small business managers to focus on strengthening collaborations and investing in technology to achieve sustainable growth and development.

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1. Introduction

Innovation is a concept up to the presentation of good ideas. The purpose of innovation is the process of an idea growing to the stage of practical application. Innovation is the engine of utilization and competition. In this regard, it is necessary the research and development will be as an integrated form so that it will not lead to performance inequality and the obstacles through innovation is deleted, or it will be minimized (Dareshiri et al., 2019). Nowadays, innovation is considered a necessity for each company considering the competition in the global market and fast development of technology, and it is increasingly converted as one of the main long-term factors of the success of companies in competitive markets. On the other hand, present competition in the present situation of the market forces the organizations to make strategies for encountering this competition to reach higher performance (Toofani et al., 2018). Today, by the formation of competitive, complicated environments, the only organizations can continue their activity, which reinforces their performance in important organizational capabilities. Performing innovative activities provides an endless resource for competitive advantage. Innovative performance is obtained by creating the knowledge needed for product development and new production processes or the improvement of present processes. The organizations with focusing innovation follow to increase utilization and the improvement of their economic situation (Saghafi and Hadadi, 2018). The reinforcement of interactions and shares among these three organizations of university, industry, and government is one of the most important factors for business growth and the processes related to innovation so that the dynamic interaction among these three organizations simplifies knowledge flow continuously and provides the possibility of making dynamics in the field of innovation. The concern of relating university achievements with industry (society) needs and among three basic active principles in the field of innovation (university, industry, and government) which is noted triple helix actors in the literature of innovation area, is considered as one of the most important topics in this field (Zarghami, 2018).

The innovation of this research is that it examines innovation and development as a key factor in the growth and development of small innovative enterprises (SIEs). The results show that effective collaboration between universities, industry and government significantly contributes to the development of innovation. The use of new technologies and the allocation of resources to research and development projects are known as facilitating factors in this process. Also, the challenges of lack of resources and lack of cooperation can hinder the progress of innovation. Finally, this study emphasizes the importance of creating ecosystems of collaboration and knowledge exchange that can lead to improved innovation capabilities in small firms. In the second part, i.e., in the theoretical literature and research background, the need for continuous improvement of innovative performance and the challenges organizations face have been emphasized. The theoretical literature was comprehensively explained, and the latest scientific research on the subject was presented. In the third part, the research model, the triple helix model is introduced and the research methodology including data collection from small innovative companies is explained. In the fourth section, which is dedicated to the analysis of the results, the data were comprehensively and systematically reviewed and analysed. These analyses were performed using appropriate statistical methods in SPSS to identify meaningful patterns and relationships between variables. And finally, in the conclusion part, the findings are summarized and the importance of cooperation and technology is emphasized instead of just increasing research and development budgets.

2. Theoretical literature and research background

Continuous improvement of the innovative performance of an organization is one of the key factors for the survival of knowledge-based organizations. The innovation in performance in these organizations causes to keep growth and competitive advantage. Creating innovative performance needs to make effective and stable communications with others (Dehghanian and Harandi,

2014). The necessity of creativity and innovation presence in organizations is reached the extent that some experts consider the lack of it as being equal to destroying the organization. Since the innovation for companies is considered a necessity, the organizations should proceed to recognize key factors of creating innovation capability and innovative performance (Ismaeelpour and Aram, 2018). Innovative performance is obtained with the help of knowledge management and suitable social interactions for product development and new production processes or improvement of present processes. At present, in most organizations and companies, the innovation is converted to the most important stimulant for reaching in competitive success. Foreign competition makes the companies under pressure to produce different products and services and continuously follow the innovation in which knowledge and information are one of its prerequisites (Yazdani et al., 2016). This research examines innovation and development as key factors in the growth and development of small innovative enterprises (SIEs). The results show that effective collaboration between universities, industry, and government significantly contributes to innovation development. The use of new technologies and allocating resources to research and development projects are facilitating factors in this process. Also, challenges such as lack of resources and lack of cooperation can hinder the progress of innovation. Finally, this study emphasizes the importance of creating ecosystems of cooperation and knowledge exchange that can improve innovation capacities in small companies.

2.1. Innovation

For the first time, the innovation was defined by Schumpeter (1934) as producing fresh products that involving process innovation and product innovation for new markets. Fresh products are made by technology innovation and administrative innovation, which is resulted in organizational change. Drucker (1985) introduced innovation as a purposeful and organized search for change. Damanpour (1991) believes that innovation has two

stages of initiative and implementation. Innovation occurs when a new thought or decision for adaptability with the environment is presented. (Lampkin and Dess, 1996) defines the dimension of innovation as the tendency of an organization to company and supporting new ideas and creative processes that may be appeared in the form of new products, services, or technological processes (Akbari et al., 2017). The researchers presented multiple definitions of innovation. A definition knows innovation as the first use of new knowledge, while in another definition, innovation is known as the new strategy. Roberts (1998) defines innovation as follows:

Utilization+ Invention = Innovation

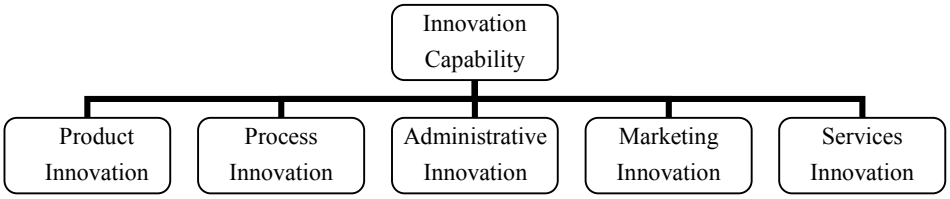

Fig. Innovation capability, Source: Qarabashlooni and Soleimanzadeh (2016).

Table 1. Types of innovation processes

Researcher	Year	Type of Innovation
March	1991	Exploratory, extraction
Kang bin &Zascovic	1998	Product, process
Lee et al	2010	Exploratory, extraction
Zhuhansen & Alsen	2011	Architectural, fundamental, incremental, contractual

Source: Safur Elahi et al., (2014)

2.2. Innovative Performance

Innovative performance is one of the main factors of organizational performance which helps to organizational learning of innovation, learning from defeats and conformity with the dynamic competitive environment and innovative performance is a combination of organizational achievements which is obtained from the improvement of activities (Hajizadeh and

Sardari, 2018). Innovation or innovative performance often points to company performance in making innovation in the product (or service) and the process of product producing (or services) (Sadr and Ansari, 2015). Organizational performance has different aspects. Innovation performance is a combination of general successes of the organization, along with made attempts for innovation and improvement and applying different aspects of innovation in the organization (Ahmadi et al., 2017). Innovation performance is considered as a market reward for the achievement of new products for sale and organizational profit. Accordingly, the success and application of products or new projects should be considered as a dimension of the innovation performance of the firm (Elyasi et al., 2018). Innovative performance is defined through innovative inputs. It means that converting data to output and at last innovative output is related to company performance. Innovative performance, due to innovative output, along with company performance, may affect innovative costs, can be divided into several categories. But in general, the economic performance of a company may affect the following three stages of company lifetime: (1) decision for innovation, (2) innovation output, (3) output of innovative performance.

In general, innovative performance has two dimensions: efficiency and profitability of innovation. While innovative personal performance has three dimensions: production, improvement, and understanding innovative ideas (Ahmadi et al., 2017), innovative performance points to the ability of the company because it will be the user of new ideas, instruments, systems, strategies, programs, processes, products, and services. Innovative performance is defined through innovative inputs. It means that converting data to output and at last innovative output is related to company performance (Ismailpour and Aram 2018). Innovation performance is a combination of general successes of the organization by done attempts for innovation and improvement and applying different aspects of innovation in the organization. Innovation performance in literature review is considered as one of the most important drivers of other performance aspects of the

organization due to continuous attempts to improve, restoration, discovering, learning of defaults, conformity with the competitive environment which is done to speed of variable (Elahi et al., 2014).

Table 2. Types of innovative performance

Row	Type	Definition
1	Innovation in the product (service)	It implies a unique product (service) to other products (services).
2	Innovation in the market	It implies new marketing methods.
3	Innovation in process	It is included in creative mechanisms and inventive methods and part of technology innovation.
4	Innovation in behavior	It implies on the culture of innovator and receiving new ideas from personnel.
5	Innovation in strategy	It implies new competitive strategies that make value for the company.

Source: (Nikpour, 2018)

2.3. The indices of innovative performance measurement

Innovation measurement is complicated work, and its measurement criteria are usually uncertain and invalid, but hence, some measurable criteria are introduced and used by researchers. Based on the purpose of research, some measurement instruments at the company level are only considered. Innovation survey is among the most important instruments and innovation measurements that it is mentioned and then performed for the first time in 1992 by the European Union. Innovation survey is an instrument for science and technology policymakers to measure the innovative behaviour of companies. In the innovation survey, different aspects of innovation, such as innovation in product, innovation in process, innovation obstacles, etc. are measured. Iran's innovation survey was started in 2013 by presidency technology and scientific deputy and finished in 2016. For the measurement of innovation indices in this project, the indices related to innovation in the

product (goods or services), innovation in the process (processes of supply and support), innovative activities and the costs related to innovation in product and process, organizational innovation, marketing innovation and quantitative information of research activities such as the number of registered patents in national and international level, the number of commercialized patents, the number of expert workforces in important sections in making innovation like a section of research and development and other cases are used. Recognizing noted indices in innovation surveys is based on the Oslo Manual, which at present, is considered a widely used approach of monitoring and measuring innovation through diverse innovation surveys (Dareshiri et al., 2019).

2. 4. Triple helix model

The first presented pattern introduced after the Second World War for innovation explanation was a linear pattern in which the science led to technology, and the technology responds to the needs of the market. In this model, science pressure is considered as a stimulant force of innovation. (Sobhani et al., 2017). Triple helix pattern mentioned in 1996 by Etzkowitz and Leydesdorff with the purpose of description and explanation of triple pillar interactions (government, industry, and university) in the process of innovation and development. Zarghami (2018) in the late 80s, as well as (Klein and Rosenberg, 1986) and Freeman (1987) criticized linear patterns and considered other patterns such as interactive chain pattern. Systematic attitude to the innovation process and its determining factors manifested another pattern which in the late 80s and early 90s was employed by some experts of science, technology and innovation such as Freeman (1995), Lundvall (1992) and Nelson (1993). Also, it led to the formation of national innovation theory (Sobhani et al., 2017).

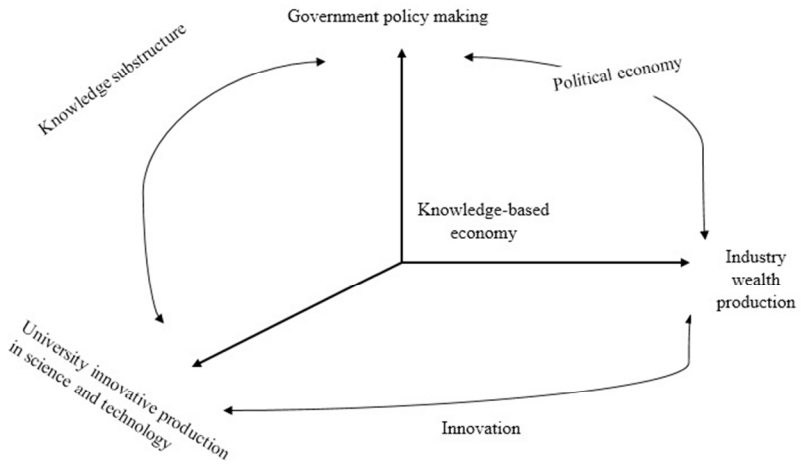

Fig 2. Triple helix role in a knowledge-based economy
Source: Momeni et al., 2016

Based on the triple helix model, universities, producers, and transmitters of knowledge and industries are producers of services and products, while the government among them have control and moderating role. In general, developing a knowledge role in the community and development of university roles in the economy is analysed through the triple helix relations of university, industry, and government. When universities, industries, and government participate in economic development and are involved or mediate research activities of the university, a network of interactions is made as to the helix.

The triple helix pattern is built based on the interaction and dynamics of these three main institutions, and its efficiency is proved by performing different conceptual and practical research in different societies in a stable development route and tending to the purposes of the knowledge economy and knowledge-based society (Zarghami, 2018).

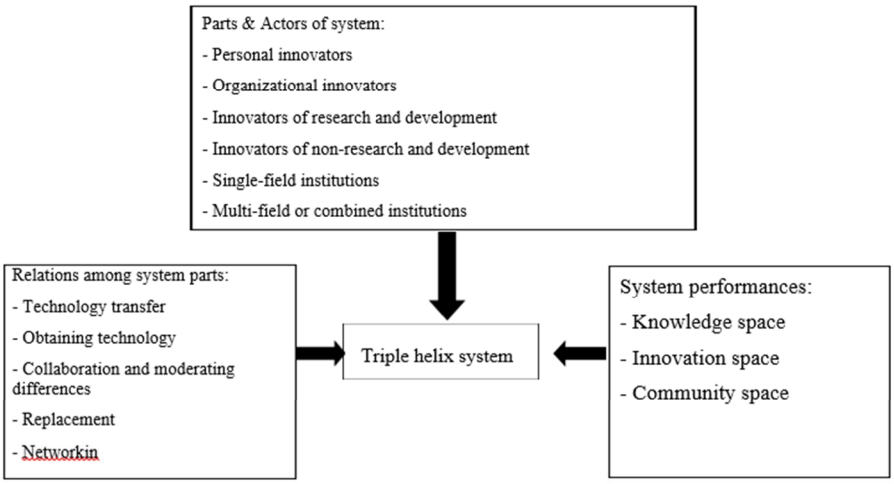

Fig 3. Triple helix system
Sources: Momeni et al., 2016

The first generation of the triple helix

As observed in Fig 4. in the first generation of the triple helix pattern, the role of government is controlling and making relationships between university and industry. This situation indicates a pattern in which a pillar (government) dominates on two other pillars and control their relationships.

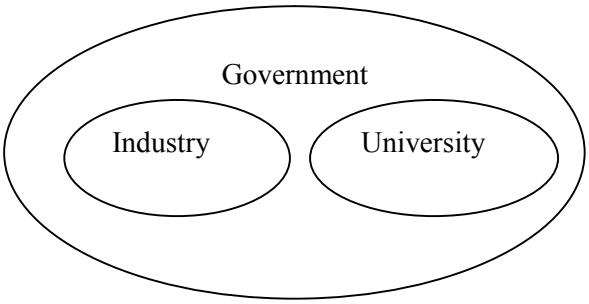

Fig 4. First type of triple helix pattern of the relations between university, industry, and government, Sources: Etzkowitz, 2008

The second generation of triple helix pattern

The second generation pattern is included in independent institutions with clear borders that separate triple principles. This pattern is called the pattern of lack of government interference; it is a strategy for decreasing the role of government in the first type.

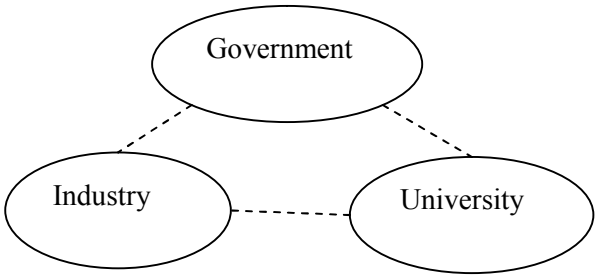

Fig 5. Second type (the pattern of lack of government interference in the relations of university, industry, and government), Source: Etzkowitz, 2008

The third generation of triple helix

THM third helix type indicates the role of triple pillars in the process of innovation and knowledge production. In this overlap, each of the pillars collaborates with two other pillars and also combined organizations made in common areas.

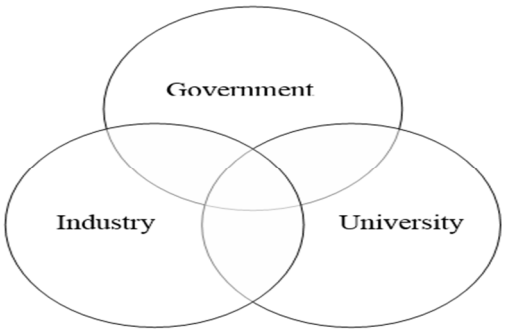

Fig 6. Pattern of the third type of triple helix of the relations of government, university, and industry, Sources: Etzkowitz, 2008

Fig 7. Dynamic view of the third type of triple helix of the relations of government, university and industry, Source: Etzkowitz, 2008

2.5. Research Background

The triple helix presented university-industry-government relations as a cooperative three-player game with transferable tools. Then, kernel, Shapley value, and kernel were used as synergistic indicators in an innovation system. While Shapley's values and the core always exist, he claimed that the core may not exist (Mêgnigbêto, E. 2024). Murillo-Luna, & Hernández-Trasobares, (2023) investigated the possible synergistic effect of cooperation between companies and the main factors of the triple helix approach (academia, industry, and government) on the environmental innovation of companies. The results of the analysis of a large sample of Spanish companies from different sectors (38,269 observations) over 9 years show that collaboration between companies and representatives of the Triple Helix, both individually and jointly, increases the probability of corporate environmental innovation. The more triple helix factors are involved in collaboration with companies, the more likely companies are to be environmentally innovative.

Cai, & Lattu, (2022) First, by reviewing the existing literature using two spiral models to identify research gaps, they found that these studies were influenced by three perspectives on the relationships between the two models, which were on a continuum between two extremes. That is the separation versus integration of two models. Second, they provided a systematic comparison of the strengths and weaknesses of the two models, and this may help researchers choose appropriate spiral models as conceptual/analytical tools in their empirical innovation studies. Third, their comparison of these two models shows that they complement each other to a great extent when analysing innovation processes in contemporary society and provide the basis for potential synergies between the two spiral models.

Paramita, et al. (2021) Using the triple helix model, they showed that batik entrepreneurs in the Lomajang district are used to improve the economy of the surrounding community in addition to preserving the culture. Batik culture is in the form of regional motifs such as great Banana, Sand, and Samru Mountain batik motifs applied to the fabric by the batik process, which is later used as clothing for the Lumajang District Government. Increasing the capacity of batik artisans also needs to be improved through educational activities.

De Almeida Borges, et al. (2020) They analyzed a case study of an example and identified and contextualized the roles of the actors as suggested by the authors of the triple helix model. They made an extensive theoretical analysis followed by a review of data from the University of Brasilia to discuss the practical results provided by the bibliography and serve as a basis for institutional policies on the subject. The University of Brasilia presented significant results in the regional scenario. They concluded that understanding the functioning of the triple helix would be possible when system components assumed the role of government through legislation, promotion, and/or development support.

Adams et al., (2019) performed research as "strategic orientation, innovative performance, and the moderating effect of marketing management." The

findings showed that using marketing management instruments, especially related to the marketing mix, has a positive effect on the relationship between consumer, technology, and combined consumer/technology and innovation performance. Secondly, the results showed that the mediating effect of marketing management is concurrently increased on the relationship between tendency and performance by applying more factors from the marketing mix. Their focus on consumers and technology has a positive correlation with innovative performance.

Elyasi et al., (2018) research as "surveying the role of innovation strategy on the innovative performance of organizations (case study: knowledge-based companies of biotechnology." Based on obtained results from 142 knowledge-based companies using the structural equation modelling method, the hypotheses of research were confirmed. Also, the mediating role of the innovation strategy of research and development in the relation among variables was confirmed.

Noori et al., (2017) performed research as "innovative performance of Iranian knowledge-based companies: big companies or SME." Using log regression in the first stage, it was recognized that the cost of research and development confirms a direct relationship with company ratio with company size in a continuous spectrum of size. In the second stage of the study, covariance analysis was used for decreasing company size using quantitative variables of physical capital structure. Also, the results showed that the classification of the small, medium and large firms has a significant difference in terms of the amount of innovation activity in the same physical capital structure.

Gomes and Matte Wojahn, (2017) research with the title of "the ability of organizational learning, innovation, and performance: a study on small and medium companies (SMES). The purpose of this study is the analysis of the capacity effect of organizational learning on innovative performance and organizational performance of small and medium companies which results show that the capacity of organizational learning can affect the innovative performance of small and medium companies which this topic is rarely

pointed in the field of experimental articles. Also, they said that our research could evaluate the differences related to innovation between the part of production and services.

Dekoulou and Trivellas, (2017) research as "organizational structure, innovation performance, and consumer relation value in Greece industry of advertisement and media." The results showed that training caused an increase in the capacity of organization for innovation (Greco et al., 2016). In their study as "the analysis of open innovation effect on company performance" considered this basic that the types of foreign innovation channels (searching scope) used by a company, the extent which a company uses open innovation (search depth) and to some extent a company collaborates through different foreign channels (open interactional innovation), is completely related to innovative performance.

Cobo-Benita et al., (2016) in some previous studies as "the performance of innovation projects: the analysis of organizational characteristics effect." The purpose of this research is the analysis of organizational characteristics on the performance of the innovation project. This study employs Fuzzy Set Qualitative Comparative Analysis (FSQCA) and uses the sample of Spain big companies in surveying innovation of societies. The results showed that a combination of organizational innovation, company size, and collaboration with national, especially international companies, can help to the success of innovation projects.

3. Research Method

3.1. Personal and Organizational Innovators.

Innovation systems mostly focus on institutions, especially companies, and consider the institutions as a factor that causes to improvement of some innovative processes in special areas, countries, or districts.

3.2. The innovators of research and development and innovators of non-research and development.

In the field of triple helix in universities, research groups and interdisciplinary research centres, industry, sections of units of research and development of the company in the section of government, public research organizations, missionary research laboratories, etc. are considered as the innovators of research and development. Based on the triple helix system, three institutional areas are included university, industry, and government. Hence, during the time, communication pattern is made among these three areas which are: (1) the triple helix model of a command economy or strong government (2), the triple helix model of government non-intervention, (3) the triple helix model in which there is an overlap between the three domains (Momeni et al., 2016). This research will be done descriptively and analytically. The statistical population includes 50 small innovative companies in Tehran province, which were selected as an example of active companies in this field. The random sampling method will be used to select 10 companies from this society to provide diversity and proper representation of the whole society and the data will be through standard questionnaires and semi-structured interviews with 30 experts and academic experts of industry and government in the development of innovative companies in the country. The questionnaires include closed and open questions that examine various factors influencing the development of small innovative companies and their interactions with universities and government institutions. Data analysis will be done using SPSS software. At this stage, descriptive and inferential statistical methods are used to investigate the relationships between variables and the impact of the triple helix model on the development of innovation in small companies, and the theoretical framework of the research is based on the triple helix model which analyzes. This model will be used as an analytical tool to understand how innovation is formed and strengthened in small companies. The stages of the research will include designing the questionnaire, collecting data through interviews and distributing the questionnaire, and finally analysing the data and presenting the results. These steps are done to achieve valid and reliable results.

4. Analysis of results

Data collected from 30 questionnaires in 10 innovative small companies were analysed using SPSS, focusing on four key variables: cooperation with universities, research and development budget, use of technology and innovation development.

Table 3. Descriptive statistics of variables

Variable	Mean	Standard Deviation	N
Collaboration	0.57	0.504	30
R&D Budget	40.17	23.36	30
Technology Usage	4.77	2.50	30
Innovation Development	5.77	2.34	30

Source: research findings

The average level of cooperation with universities is 0.57 and the standard deviation is 0.504. The research and development budget with an average of 40.17 and a standard deviation of 23.36 shows the diversity in the allocation of financial resources. The use of technology with an average of 4.77 and a standard deviation of 2.50 indicates relatively good productivity of technology in companies. Finally, innovation development with a mean of 5.77 and a standard deviation of 2.34 indicates the positive performance of companies in this field.

Table 4. Correlation matrix

Variable	Collaboration	R&D Budget	Tech Usage	Innovation Development
Collaboration	1	0.197	0.820**	0.845**
R&D Budget	0.197	1	0.243	0.319
Tech Usage	0.820**	0.243	1	0.873**
Innovation Development	0.845**	0.319	0.873**	1

Note: Correlation is significant at the 0.01 level (2-tailed).

Source: research findings

The presented table shows the correlation matrix between four key variables in small innovative companies: cooperation, research and development budget, technology use, and innovation development. The results show that collaboration has a strong and significant correlation with technology use (r = 0.820) and innovation development (r = 0.845), which indicates that increased collaboration can lead to improved technology use and innovation development. Also, the use of technology and the development of innovation have a strong correlation (r = 0.873), which emphasizes the importance of technology in the innovation process. Research and development budgets generally have weaker correlations with other variables, especially with collaboration (r = 0.197) and technology use (r = 0.243). These results show that collaboration and technology play a key role in the development of innovation, the impact of R&D funding may be less directly noticeable.

Table 5. Model regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.909	0.825	0.805	1.034

Source: research findings

The presented table shows the results of a regression model that examines the relationship between independent and dependent variables in the field of innovation in small and medium-sized companies. The correlation coefficient (R) is equal to 0.909, which indicates the existence of a strong and positive relationship between the variables. The value of R square (R^2) is equal to 0.825, indicating that 82.5% of the variance of the dependent variable is explained by the independent variables of the model. Also, the value of adjusted R square (Adjusted R^2) is equal to 0.805, which indicates the predictive power of the model considering the number of variables and confirms that the model justifies the dependent variables well. The standard error of the estimate (Std. Error of the Estimate) is equal to 1.034, which indicates the relative accuracy of the model in predicting the real values.

Table 6. ANOVA results

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	131.548	3	43.849	40.982	0.000
Residual	27.819	26	1.070		
Total	159.367	29			

Source: research findings

The sum of squares for regression is equal to 131.548, which indicates the variance explained by the model. The degree of freedom (df) for the regression is 3, which refers to the number of independent variables. The mean square of the regression (Mean Square) is equal to 43.849. The F test with a value of 40.982 and a significance level (Sig.) equal to 0.000 indicates the existence of a significant relationship between independent and dependent variables. In other words, these results show that the regression model performs significantly better than a model without independent variables. The residual sum of squares is equal to 27.819 and its degree of freedom is 26, which indicates the unexplained variance in the data.

Table 7. Coefficients of the model

Variable	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
(Constant)	1.938		3.853	0.001
Collaboration	1.847	0.397	2.775	0.010
R&D Budget	0.011	0.115	1.357	0.187
Tech Usage	0.487	0.519	3.591	0.001

Source: research findings

The constant coefficient is equal to 1.938, which specifies the predicted value of the dependent variable if the other variables are zero. The cooperation coefficient is equal to 1.847 and has a standardized coefficient of 0.397, which indicates a positive and significant effect of this variable on the dependent variable ($t = 2.775$ and Sig. = 0.010). In other words, increasing cooperation significantly helps to increase the dependent variable. For the

research and development budget, the coefficient is equal to 0.011 and the standardized coefficient is 0.115, which indicates the insignificant effect of this variable on the dependent variable (t = 1.357 and Sig. = 0.187). The use of technology also has a coefficient of 0.487 and a standardized coefficient of 0.519, which indicates its positive and significant effect on the dependent variable (t = 3.591 and Sig. = 0.001). These results show that collaboration and technology use have a significant effect on innovation development, while R&D funding does not have a significant effect.

Descriptive statistics showed that the average level of collaboration with the university was relatively low (mean = 0.57), while the average R&D budget was 40.17, indicating significant variation in the allocation of financial resources. Technology utilization scored higher (mean = 4.77), indicating effective integration of technology in these firms, and this correlated with a strong mean score for innovation development (mean = 5.77). Correlation analysis showed strong relationships between collaboration and both variables of technology use (r = 0.820) and innovation development (r = 0.845). This suggests that increased collaboration can significantly improve technology adoption and innovation outcomes. Also, the use of technology has a strong correlation with the development of innovation (r = 0.873), which emphasizes its importance in fostering innovation. Regression analysis showed a strong fit of the model (R^2 = 0.825), explaining 82.5% of the variance of innovation development. ANOVA results confirmed the significance of the regression model (F = 40.982, $p < 0.001$). The coefficients showed that while collaboration (β = 1.847, p = 0.010) and technology use (β = 0.487, p = 0.001) significantly affect innovation development, R&D funding is not significant (β = 0.011, p = 0.187). These findings emphasize the importance of fostering collaboration and technology use rather than simply increasing R&D spending to improve innovation in small firms.

5. Conclusion and policy recommendation

This research comprehensively examines the impact of the triple helix model on the development of small innovative enterprises (SIE) and its results clearly indicate the importance of cooperation between universities, industry and the government in promoting innovation and economic performance of these companies. The findings indicate that the mere increase of research and development budgets cannot lead to the improvement of innovation alone; rather, effective communication and knowledge exchange between these three key institutions are known as determining factors in the success of innovation. The statistical analysis conducted on the data collected from innovative small companies in Tehran shows that technology and innovation act as the main engines of economic growth. The research results show that government support and university collaborations can significantly help facilitate the innovation process.

These findings emphasize the importance of designing and implementing support policies that lead to strengthening synergies between different economic sectors. In addition, the challenges faced by organizations in the path of innovation require new approaches and flexibility in management strategies. In this regard, it is suggested that companies use innovative methods in management and production in order to increase their competitiveness and continuously seek to improve their processes and products. This requires investment in training and development of workforce skills so that employees have the necessary abilities to face new challenges. One of the key points addressed in this research is the need to create appropriate infrastructure to support innovation.

These infrastructures include access to financial resources, advanced technologies and effective communication networks. Especially in the digital age, companies must respond quickly to technological developments and take advantage of new technologies such as big data and artificial intelligence. Finally, this study emphasizes the importance of investing in technological infrastructure and strengthening international cooperation. Policymakers should

pay more attention to the development of innovative ecosystems in order to take advantage of the potential of small companies. These results can be used as a basis for future research in the field of innovation and economic development and provide practical solutions to improve innovative performance at the national and international levels. In addition, it is suggested that future researches should investigate cultural and social influences on innovation more deeply and pay more attention to the analysis of how interactions between different actors in the innovation ecosystem. This can lead to the identification of best practices and models of international cooperation that will contribute to sustainable development and economic growth.

For future research, researchers can use the following points:

1. Big data analysis: It is suggested that researchers use data mining and machine learning techniques to analyse big data to identify new patterns in economic behaviour.
2. Behavioural economics modelling: more research should be done in the field of behavioural economics and psychological effects on economic decisions. This can include examining social, cultural, and psychological influences on consumer behaviour.
3. Economic stability: examining economic stability in the face of climate change and global crises, including the economic effects caused by environmental changes, can be an important issue.
4. Digital economy: With the expansion of digital technologies, examining the effects of the digital economy on the labour market, production and distribution of wealth can help to better understand future developments.
5. Analysis of economic policies: It is suggested that researchers do a deeper analysis of the economic policies of governments and examine their effects on economic growth and income distribution.
6. International cooperation: Examining the effects of international cooperation on economic development and global trade, especially in crisis situations, can help to better understand global dynamics.

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All authors had contribution in preparing this paper.

Conflicts of interest

The authors declare no conflict of interest.

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