
Investigating the Relationship of Technological Entrepreneurship Ecosystem and Crowdfunding According to Isenberg's Model

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Purpose: The cities of the world are becoming centers of innovation, and today the technological entrepreneurship ecosystem is very important. Therefore, the purpose of this study was to investigating the relationship of technological entrepreneurship ecosystem and crowd funding according to Isenberg's model.

Methodology: In a descriptive-analytical study from type of correlation, 225 people from middle and senior managers and experts in the field of investment were selected as a sample based on Cochran's formula by simple random sampling method. The samples responded to the standard questionnaires of technological entrepreneurship ecosystem (Isenberg, 2011) and crowd funding (Shabani, 2012), whose validity and reliability were confirmed. Data were analyzed with Pearson correlation coefficients and linear regression tests in SPSS²⁴ software.

Findings: The findings showed that all six components of the technological entrepreneurship ecosystem including policy, financing, culture, supports, human capital, and markets had a positive and significant correlation with all four components of crowd funding including the type, role, goals, and scope of crowd funding. Also, the components of technological entrepreneurship ecosystem could significantly explain 62.7% of crowd funding changes, which according to the beta value, the variables of policy, human capital, culture, markets, financing and supports had a direct and significant effect on crowd funding ($P < 0.001$).

Conclusion: The results indicated the relation and effective role of technological entrepreneurship ecosystem in crowd funding. Therefore, for the improvement of crowd funding can be provided the ground for the promotion of the technological entrepreneurship ecosystem.

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1. Introduction

The concept of entrepreneurial ecosystem emphasizes the combination or interaction of elements that support entrepreneurial activity, and these elements include cultural, social, and material characteristics. An entrepreneurial ecosystem is not controlled by a single agent, but rather emerges from the uncoordinated and semi-autonomous actions of individual actors instead of top-down control, and develops over time (Surie, 2017). The technological entrepreneurial ecosystem comprises six dimensions: policy, finance, culture, support, human capital, and markets. Policies involve two factors, government and leadership, and governments cannot create the ecosystem alone and must involve the private sector and allow them to have a significant share in the success of the ecosystem. Bank loans are the most common foreign source of financing for many small and medium-sized businesses and entrepreneurs, which often rely on direct debt and require flow of funds and investment for startups. Cultural characteristics, beliefs and fundamental attitudes about the entrepreneurial ecosystem are models of the latest trend in examining entrepreneurship. In the support dimension, non-governmental institutions, trades, and infrastructure play important supportive roles, and the entrepreneurial infrastructure includes networks of skilled and specialized consultants who collaborate with each other and help entrepreneurs to acquire the necessary skills and knowledge. Human capital provides two main sources for the entrepreneurial ecosystem, and experts believe that universities contribute to the development of human capital in a region and at the same time nurture an entrepreneurial mindset and encourage them to start risky new businesses. Markets have two components, customers and networks, and access to local markets is the key to providing opportunities in entrepreneurial ecosystems (Isenberg, 2010). Entrepreneurial ecosystems are a set of entrepreneurial actors, organizations, institutions, and processes that formally and informally come together to connect, mediate, and manage performance in the local entrepreneurial environment and this ecosystem is the product of various mechanisms of an actor in different fields that evolves over time (Han, Ruan, Wang and Zhou, 2021).

Crowdfunding can play an effective role in the ecosystem of technological entrepreneurship, and this structure is one of the innovative and technology-based processes that are changing the capital market space (Saeedi Aghdam, Alemtabriz, Sarafizadeh Qazvini and Zandhessami, 2019). Crowdfunding can be considered as a framework for entrepreneurship development when a group of different individuals invest in an investment event (Presenza et al., 2019). Crowdfunding refers to the use of the internet and the power of mass individuals to collect capital in a transparent and free way, which indicates a technology-based solution to the constraints caused by the institutionalization and economic pressures of capital markets (Ferreira, Papaoikonomou, and Terceno, 2022). Crowdfunding is a public call, especially through the internet, to provide resources in the form of voluntary assistance or exchange of rewards and voting rights to support initiatives in achieving specific goals (Leonski, 2022). The term crowdfunding emerged due to the financial crisis of 2008, and given the banks' low tendency to lend, entrepreneurs began searching for other ways to attract capital, and the investment method changed from traditional investment, which was done by friends and family, to crowdfunding (Doan and Toledano, 2018). This concept is the latest link in obtaining external capital instead of using bank loans and risky investments, and this group, who are usually internet users, is formed with the aim of supporting the idea creators by paying some or all the required investment costs to implement an idea or project (Fehrer and Nenonen, 2020). Crowdfunding is a collective effort of individuals who form a network through the internet to invest in and support the ideas of other individuals and organizations, and businesses launched through crowdfunding confirm the profitability of this method of capital raising, which acts as an intermediary between the idea and the investor (Yasar, Yilmaz, Hatipoglu and Salih, 2022).

Babaei Fishani et al. (2023) reported in their research titled "Developing a Model for Technological Entrepreneurship Ecosystem in Active Knowledge-Based Startups in the FinTech Sector" that the outcome of their study includes the development and transfer of entrepreneurship accompanied by technological startups, science and technology parks, accelerators, the use of technical knowledge, and the establishment

of technological and entrepreneurial startups along with technological products, technology universities, the technology value network, and knowledge based on technology.

Zaeim, Mosakhani, and Davari (2022) concluded in their research on identifying the dimensions of the university technological entrepreneurship ecosystem from the perspective of experts of university incubators that the dimensions of the ecosystem include university policies and support, culture, infrastructure, financial supply, government policymaking, human capital, and the market; the university policies and support variable had the highest average among the variables, while the market variable had the lowest average. Therefore, universities have a good situation by providing suitable infrastructures to support active players in this ecosystem, but the market is not in a suitable position in creating new markets for university-based innovative products in international markets and in improving the business environment in the country.

Hematian Khayyat, Zand Hesami, and Davari (2022) introduced the dimensions and components of the technological entrepreneurship ecosystem in creative digital industries, which includes technological and innovative factors that transform the ecosystem (increasing the innovation penetration rate and increasing the technology penetration rate), business or organizational factors that transform the ecosystem (developing human resources, strategic organization development, and developing communications), environmental factors that transform the ecosystem (legal environment, social environment, economic environment, and institutional environment), ecosystem transformation support factors (hardware support, software support, and financial support), digital technology cultural principles (duality of creativity and skill, ethics, talent treasury, and duality of tradition and modernity), and digital technology cultural values (supported cultural values and supported technological values).

Kordheydari, Mansouri Moayyed, and Khodadad Hoseini (2019) mentioned in their research on the beyond combining effective factors in the development of new technological businesses in the entrepreneurship ecosystem that there are 36 concepts in 12 components of policymakers, higher education institutions and universities, supporters, markets, organizational factors, incubators, accelerators, investors, institutions, players and stakeholders, culture and society, and individual factors.

Saeedi Aghdam et al. (2019) reported in their research on simulating crowdfunding in the technological entrepreneurship ecosystem that the cash flows show a high sensitivity to changes in the number of investors in each unit. Furthermore, increasing economic regulations has a significant impact on the variables of sustainable entrepreneurship development and the development of crowdfunding platforms, and it leads to an increase in sustainable entrepreneurship development. Increasing investment has a suitable effect on strengthening innovation in growth and technology centers and reducing government intervention. Changes in promotion costs lead to an increase in the promotion rate of crowdfunding in periods 18 to 30 and have a positive effect on reducing taxes.

Meysami, Mohammadi Elyasi, Mobini Dehkordi, and Hejazi (2017) introduced the effective components in the technological entrepreneurship ecosystem, including the market, culture, technological entrepreneur, talents, education and research, networks and interactions, support, capital, governance, organizations, special conditions, and infrastructure, in their research.

2. Methodology

This study was a practical research in terms of purpose; and methodologically was a descriptive-analytical correlation type in terms of method. The research population consisted of middle and senior managers, as well as experts in the field of investment, and a sample size of 225 people was determined based on Cochran's formula. This number was selected using simple random sampling method. In this method, a code was assigned to each member of the population and then using the random number table, 225 people were selected as the sample. The demographic characteristics of the research sample are presented in Table 1, which shows that the majority of the samples were male (61.78%) and had a postgraduate degree (67.11%) and work experience of 6-10 years (41.78%).

Table 1. Demographic characteristics of subjects

Variable	Value	Frequency	Percentage
Gender	Female	86	38.22
	Male	139	61.78
Education	Associate degree	21	9.33
	Bachelor's degree	33	14.67
	Master's Degree	151	67.11
	PhD	20	8.89
Work experience (years)	1-5	27	12.00
	6-10	94	41.78
	11-15	42	18.67
	16-20	35	15.56
	> 20	27	12.00

In this study, three tools were used. The first tool was a form of demographic characteristics designed by the researchers that measured information about gender, education, and work experience. The second tool was the standard questionnaire for the entrepreneurial ecosystem of technology, designed by Isenberg in 2011. This tool had 28 items in 6 dimensions: policy, financial provision, culture, support, human capital, and markets, which were answered using a Likert spectrum of five values: very appropriate, appropriate, indifferent, inappropriate, and very inappropriate. Isenberg (2011) examined the structural validity of the tool by exploratory factor analysis, and the results indicated the existence of six factors - policy, financial provision, culture, support, human capital, and markets - and the reliability of the overall tool and all its factors above 0.70 using Cronbach's alpha method. In this study, the reliability of the questionnaire for entrepreneurial ecosystem of technology was calculated using Cronbach's alpha method, resulting in 0.89.

The third tool was the standard questionnaire for crowdfunding designed by Shabanian in 2012. This tool had 18 items in 4 dimensions: type of crowdfunding, role of crowdfunding, objectives of crowdfunding, and scope of crowdfunding, which were answered using a Likert spectrum of five values: very appropriate, appropriate, indifferent, inappropriate, and very inappropriate. Shabanian (2012) examined the structural validity of the tool by exploratory factor analysis, and the results indicated the existence of four factors - type of crowdfunding, role of crowdfunding, objectives of crowdfunding, and scope of crowdfunding - and the reliability of the overall tool and all its factors above 0.70 using Cronbach's alpha method. In this study, the reliability of the crowdfunding questionnaire was calculated using Cronbach's alpha method, resulting in 0.82.

The research process began by determining the population size and sample size, selecting 225 participants randomly, giving each participant a code, and ensuring their understanding of the importance and ethical considerations of the research. Participants were asked to consent to participate, carefully answer the research tools, and were appreciated and thanked after completing the tools. The collected data were prepared for computer entry. Finally, the data were analyzed using Pearson correlation and linear regression in the SPSS24 software at a significant level of 0.05.

3. Findings

There was no dropout in the samples, and the analyses were performed for 225 individuals. Pearson correlation coefficients for the relationship between the technological entrepreneurship ecosystem and crowdfunding were presented in Table 2, based on which all six components of the technological entrepreneurship ecosystem, including Policy, Financial, Culture, Support, Human Capital, and Markets,

had a significant and positive correlation with all four components of crowdfunding, including Type, Role, Goals and Scope of crowdfunding ($P < 0.001$).

Table 2. Pearson's coefficients of correlation for the relationship between entrepreneurship and crowdfunding

Entrepreneurship ecosystem	Crowdfunding			
	Type	Role	Objectives	Range
Politics	0.274**	0.426**	0.382**	0.481**
Fundings	0.237**	0.197**	0.806**	0.656**
Culture	0.351**	0.296**	0.531**	0.738**
Supports	0.423**	0.389**	0.302**	0.419**
Human capital	0.397**	0.333**	0.195**	0.280**
Markets	0.572**	0.388**	0.285**	0.348**

** $p < 0.001$

The normality assumption of the variables was not rejected based on the skewness and kurtosis values, as they were within the range of -1 to +1. Furthermore, the assumption of multicollinearity was not rejected due to the variance inflation factor being less than 10. In addition, the assumption of homoscedasticity was not rejected based on the Durbin-Watson statistic of 1.58. Therefore, the use of regression analysis was justified.

Linear regression analysis of the relationship between the technological entrepreneurship ecosystem and crowdfunding was presented in Tables 3 and 4, based on which the components of the technological entrepreneurship ecosystem could significantly explain 62.7% of the crowdfunding variations, with Policy, Human Capital, Culture, Markets, Financial, and Support variables having a direct and significant effect on crowdfunding ($P < 0.001$).

Table 3. Linear regression for the relationship between entrepreneurship ecosystem and crowdfunding

Model	R	R Square	F	Sig
1	0.752	0.627	26.483	0.001

Table 4. Standard and non-standard coefficients of the linear regression for the relationship between entrepreneurship ecosystem and crowdfunding

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std Error	Beta		
Constant	4.254	1.384	10.189	3.234	0.001
Politics	0.247	0.133	0.239	0.412	0.001
Fundings	0.056	0.174	0.126	0.287	0.001
1 Culture	0.283	0.198	0.178	1.631	0.001
Supports	0.362	0.347	0.064	1.278	0.001
Human capital	1.398	0.412	0.214	7.456	0.001
Markets	1.361	0.342	0.129	3.569	0.001

4. Conclusion

Nowadays, the issue of crowdfunding is very important and technological entrepreneurship ecosystem can play an effective role in it. Therefore, the aim of this study was to investigate the relationship between technological entrepreneurship ecosystem and crowdfunding based on the Eisenberg model.

The findings of this study showed that all six components of the technological entrepreneurship ecosystem, including Policy, Financial, Culture, Support, Human Capital, and Markets, had a significant and positive correlation with all four components of crowdfunding. Furthermore, the components of the technological entrepreneurship ecosystem could explain 62.7% of the crowdfunding variations, with Policy, Human Capital, Culture, Markets, Financial, and Support variables having a direct and significant effect on crowdfunding. No research was found in this regard, but these findings can be consistent with the findings of the studies by Babaei Fishani et al (2023), Zaeim et al (2022), Hematian Khayyat et al (2022), Kordheydari et al (2019), Saeedi Aghdam et al (2019), and Meysami et al (2017) in some respects.

In explaining the relationship between each of the components of the entrepreneurial ecosystem, including policy, financial supply, culture, support, human capital, and markets, with each of the four components of crowdfunding, including type, role, goals, and scope, it can be said that policy is compounded of the role of government and the leadership of managers and is one of the factors that play an important role in shaping the entrepreneurial ecosystem. Political and legal factors are a key part of the economic and political structure in which entrepreneurship occurs, and foreign policy is another important issue in which interaction with advanced countries, product exportation and innovation can play a key role in upgrading the technological entrepreneurship ecosystem. Financial supply indicates that private institutions such as investors, benefactors and government supporters are responsible for financing the technological entrepreneurship ecosystem. Access to financial resources for long-term entrepreneurial projects is vital. Culture also includes success stories and social norms, which are an important part of the technological entrepreneurship ecosystem. The prominent history of successful entrepreneurship stories is a significant part of cultural perspectives. Accordingly, global market leaders who were once small entrepreneurial companies can inspire younger entrepreneurs to enter similar paths. Support is the most important factor in the technological entrepreneurship ecosystem, and this critical foundation includes non-governmental institutions, trade associations and infrastructures to support startups. Previous research has confirmed this issue. Human capital is another factor, and this structure includes human resources and the activities of educational institutions. Human capital includes professional individuals whose skills, accumulated through entrepreneurship education, and a workforce are amassed to create more companies with the goal of economic progress. Markets are another factor in the technological entrepreneurship ecosystem, with networks and customers in its subgroup. Customers and networks are the two constituents of the market and local and international markets, existing human capital, financial supply, support system and consultation, legal framework and major universities are the most critical columns of an entrepreneurial ecosystem. Given the above explanations, it seems logical for there to be a positive and significant correlation between the components of the technological entrepreneurship ecosystem, including policy, financial supply, culture, support, human capital, and markets, with each of the four components of crowdfunding, including the type of crowdfunding, the role of crowdfunding, the goals of crowdfunding and the scope of crowdfunding.

Furthermore, in describing the capabilities of the components of the technological entrepreneurship ecosystem, including policy, financial supply, culture, support, human capital, and markets, for predicting crowdfunding, it can be said that the development of the technological entrepreneurship ecosystem will not take shape by simply formulating blunt laws and programs without an ecosystemic approach and without developing the financial system, market, human capital, cultural and various support systems. In addition, the development of these systems may be possible for crowdfunding with the participation of the private sector, institutions and other players. Therefore, it is recommended that organizations, investors and entrepreneurs pay more attention to the individual components of crowdfunding. Also, managers should

have accurate consideration of the timing schedule for project implementation based on the importance of scheduling for crowdfunding, and organizational managers should carefully reflect on their behavioral and creative ideas regarding the financial dilemmas of crowdfunding.

Ethical Considerations

All ethical considerations in terms of trust-building and respecting the privacy of participants have been observed.

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Authors' Contributions

All authors have an equal share in the article.

Conflict of Interest

There is no conflict of interest among the authors.

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