Int. J. Nonlinear Anal. Appl. 16 (2025) 7, 91–106
ISSN: 2008-6822 (electronic)
http://dx.doi.org/10.22075/ijnaa.2023.31603.4679

Presenting a model of technological business accelerators in communication services companies using an ISM approach and determining model fit using a structural equation modeling technique

Mohammadreza Zare Dehabadi[a], Babak Ziyae[b,*], Seyed Mojtaba Sajadi[c]

[a] Department of Entrepreneurship, Qazvin Branch, Islamic Azad University, Qazvin, Iran

[b] Department of Corporate Entrepreneurship, Faculty of Entrepreneurship, University of Tehran, Tehran, Iran

[c] Department of Business Creation, Faculty of Entrepreneurship, University of Tehran, Tehran, Iran

(Communicated by Farshid Khojasteh)

Abstract

The main goal of this study was to design a model of technological business accelerators in communication service companies. The method used in this study included exploratory designs. The preset study was fundamental in terms of the goal. The statistical population of this study in the qualitative section consisted of experts and the quantitative section consisted of managers at Iran's telecommunication companies. For this, 19 experts in this field were interviewed via semi-structured in-depth methods. The interviews were analyzed by using Atlas T8 Software. According to the grounded theory analysis of the specialized interviews, 52 indicators were finally determined. Fuzzy Delphi was used to screen and ensure the significance of the identified indicators and select the final indicators. The Interpretive Structural Model (ISM) was used to determine the relationship and significance of activities. Data in the quantitative section were analyzed based on data collected using questionnaires in the statistical population of corporate managers. The method used was a structural equation method and path analyses were performed in SPSS and SmartPLS software. Qualitative section findings led to the identification of 52 selective codes. Using the fuzzy Delphi method for screening, 11 main categories were identified. In the Interpretive Structural Model, coaching and technological entrepreneurship were ranked first. Findings revealed that considering the current situation of the country and understanding the appropriate position of technological businesses in creating employment and new opportunities in economic fields, as well as the recognition of the accelerators of technological businesses in communication service companies help create new opportunities for entrepreneurs to achieve economic and social accomplishments in society. In the end, the study model was confirmed in the form of hypotheses.

Keywords: competitiveness, accelerators, technological business, Iran's telecommunication
2020 MSC: 97U70

*Corresponding author
Email addresses: mrzare@tci.ir (Mohammadreza Zare Dehabadi), bziyae@ut.ac.ir (Babak Ziyae), msajadi@ut.ac.ir (Seyed Mojtaba Sajadi)

Received: July 2023 *Accepted:* September 2023

1 Introduction

In today's world, the rapid development of technology and increasing competition have complicated the business environment. Modern organizations are working in a complex, insecure, but dynamic environment. One of the most recent concepts that serve to increase business strength, especially emerging businesses is business accelerators. An accelerator first covers a startup or more developed stages where a product can be offered or even an initial version of a product, and for this, it selects from among the participants a selected idea as a startup in the short term. An accelerator develops entrepreneurial capacities and competence among entrepreneurs and lays the ground for the discovery of experience-based programs using consultancy and coaching [32]. The activities done in an accelerator are what happens in practice and participants will have the chance to use reliable evaluation and the actual environment to reflect and estimate their perceived understanding of their entrepreneurial competence. It is thus important to suggest that reflecting something experientially is a key aspect of valid learning [20].

Mobayyeni Dehkordi et al. [26] elicited opportunity evaluation criteria of the accelerator formation model in three aspects of problem-solving, the entrepreneur team and accelerators. Dadjou and Mahdavi [11] also elicited partnership strategies with related companies, the offering of innovations and plans being technologically equal to foreign plans and the reduction of costs to launch accelerators. Shenkoya [33] also concluded that the aspect of the quality of services offered by accelerators was the most important aspect of accelerator model formation compared to the number of accelerators, with their specialized domains being key to attracting risk-accepting investment. Breznitz and Zhang [7] concluded that student startups whose screening processes are involved in accelerators outperform in both employment and product growth. Accelerators are recognized as a business school [6, 17] for entrepreneurs due to their capability of learning and realistic experiences [15, 16]. Accelerators can also serve as a bridge between learning and practice due to their capability of providing the necessary conditions for gaining experiences and learning in an actual form [22].

All accelerators are said to seek entrepreneurial competence and they do this based on short-term teaching entrepreneurial programs, which facilitate learning within an organization, as this process is strengthened using learning experiences by coaches and colleagues [8]. Experiences from accelerators may bring about one of the outcomes for the creative entrepreneur, which helps them start working with more confidence and pursue emerging industries; this also helps them perceive the need for a deeper perception of entrepreneurial competence, allowing them to understand that the launching and continuation of an emerging industry is not a reliable choice and to relinquish their activities [24]. A survey of research in business accelerators indicates that many of the studies have generally investigated the effects of this process on investment, ecosystems, entrepreneurship and innovation or emphasized its effects on technological medical domains, as well as physics-related sciences; hence, none of the studies has ever investigated a special industry such as the Telecommunication or ICT domains. Considering privatization and the rise of emerging industries in this industry, as well as the challenges facing these companies and relevant activities, it is essential to provide a comprehensive model to develop accelerators in such organizations and to determine the factors affecting technological businesses in this domain. Hence, the main goal of this study was to present a model of technological business accelerators in communication service companies using the ISM approach and determine a model fit using structural equation modelling.

2 Literature review

In decades when the outcomes of the ".com" bubble were evident, a new method appeared for the preparation and investment in entrepreneurship situations: a start-up accelerator or innovation facilitator [12, 25]. In fact, Paul Graham and his colleagues, formerly Internet entrepreneurs (before the .com bubble, founded the Y Combinator company in Boston and Silicon Valley in 2005, which was recognized as the accelerator [25]. This movement rapidly expanded in other areas of America and turned into the second pioneering accelerator (Tech Stars), which was founded by former Internet entrepreneurs David Cohen and Brad Feld in 2007. In subsequent years, accelerators and similar projects rapidly expanded across the world, with over 2000 of which embracing the entire world [10]. Accelerator centres collectively employ creative perspectives to administer creative and innovative ideas [9]. Thus, the dimensions an accelerator can improve consist of human dimensions, it helps recruit and develop empowered people and in financial terms, it helps attract capital [34]. Hence, accelerator centres provide entrepreneurs with professional, consultancy, coaching services and administrative spaces in the form of competitive programs. Studies on these centres are scant due to the recency of this concept [13]. Therefore, one of the main services offered by these centres is coaching businesses for entrepreneurs, performed by various goals such as achieving knowledge, professional advice, and implicit support [28]. For this, coaches at these centers use special skills and methods such as detection and solving business issues, support for user needs and goals, motivation and influence in learning to direct entrepreneurs to new business environments. One of the most effective programs at accelerator centres is coaching, which contributes to indirect learning by emphasizing accelerators [13].

The recency of this phenomenon in the entrepreneurship ecosystem causes a considerable number of challenges for researchers, including a shortage of data and experimental findings, which are key [12]. In his study "Winning a Startup Game; A Study of Designing European Startup Accelerators", Nogueira [27] demonstrated that results reflected the positive effects of a large and diverse network of partners, and sponsors. Founders and companies; however, he aimed to fully explain the mechanisms behind the successes of startups. In a study "University as a Business Accelerator in Education", Andriushchenko et al. [2] demonstrate the possible deficiencies of implementing a corporate education in the form of a university of organization as a legal person. They also identified relevant measures to evaluate the efficacy of organizational education and its practicality. Results by Nosova et al. [29] also confirmed that Artificial Intelligence technology first helps create an innovative product, provide better services to customers, assign employees to resolve more creative tasks, reduce costs, and gain better results; second, motivate developers, companies, policy-makers and users to resolve their social and economic issues, and third helps remove constraints to achieve a large set of data based on global cooperation in digital transformation.

In a comparative study, Kuster and Rezende [21] showed that networks play a final role in facilitating the internationalization of startups, reducing uncertainties, boosting innovation, and making it easier to access partners and investors. Accelerators also use organizational and commercial partnerships, as well as seminars and workshops to strengthen networks and reduce risks when entering new markets. In their study, Business Accelerators, Zuquetto et al. [38] stated that accelerators can be considered as organizations or accelerators processes, i.e., companies can use accelerators for innovation, and for this, accelerators should feature unique characteristics. Hasanpour and Aghajani [18] found that the need to form accelerators requires changing the academic culture towards acceleration and stressing the government's role in forming such accelerators, as changing academic culture toward acceleration has a direct effect on individual capabilities. However, the role of governments in forming accelerators does not have a direct effect on individual capabilities, while individual capabilities directly affect accelerator services.

A review of 35 final articles by Hasanpour et al. [19] led to the extraction of 39 open codes for individual factors and five axal codes, including demographics, psychological characteristics, the development of occupational competence, personality dimensions and dynamic individual factors. Findings by Abouei et al. [1], appropriate entrepreneurship training should update equipment and make use of various training based on employee needs. Also, academic development centres should change their structures based on needs and environmental uncertainties. Parsanejad et al. [30] also argued that startup accelerators serve as a new entrepreneurial support model that increases the pace of the development of emerging companies by offering specialized consultancy, networking opportunities and attracting investors for growth-based businesses. Results by Mahmoudzadeh [23] indicated that spatial administrators and industries, investing bodies, academies and scientific centres, support bodies such as growth centres, scientific parks and accelerators; government organizations and regulations, idea owners, including startups and companies, not to mention others are the players of the country's spatial ecosystem and play their major roles respectively.

3 Methodology

The method used in this study was an exploratory design. The present study had a fundamental goal. On the other hand, since the preset study used library sources and field surveys such as questionnaires and interviews, this study was a cross-sectional-survey type study based on data-collection methods. In sum, the study used two quantitative and qualitative approaches. In the first section of the study, library sources, and the literature on the concepts of accelerator and technological business were used, and the criterion to select the literature was the keywords of accelerators and technological businesses. The second section included interviews with 19 managers in Iran's Telecommunication Technology areas in the summer of 2020. The statistical population of the study consisted of academic experts with at least two articles on technological businesses. The administrative section consisted of people with academic degrees and at least four years of work experience in technological businesses in Iran's telecommunication technology areas. Sampling was purposive and continued until theoretical saturation was met. This study used semi-structured in-depth interviews and the 5w1h technique to answer "Why, how, what, where, who and when" questions. Codes extracted reached saturation from Interview 19 onwards, with extra interviews failing to add a new code to previous codes. These codes were sufficient for the interview section. To analyze data, Atlas TI software was used. As for the validity of the study, three methods of using question revision and question modification by experts were used and finally, the questions were reviewed by two introductory interviews. The reliability of the study continued until theoretical saturation in Interview 19. The reliability coefficient of the study between the two coders was 66%.

The data in the qualitative section were gathered by using specialized questionnaires. Specialized questionnaires were used to test the study model, Fuzzy Delphi questionnaires to identify and screen the indicators, interpretive structural model questionnaires to investigate the relationship between components and structural equation questionnaires to test the proposed model. The present study was performed in several stages using several techniques. Delphi technique, hierarchical analysis, and interpretive structural modelling were used to identify and design the pattern of index relations in this study. Data analysis methods are different in the two stages of the study. The first step is an attempt to analyze the data after collecting information from the meta-synthesis method interpreting the results, and implementing a qualitative model. The second stage, with a descriptive survey method, uses the structural-interpretive modelling method. The structural-interpretive modelling technique begins with identifying variables that are relevant to the topic under discussion. After variable identification, they are entered into the self-interactive structural matrix (SSIM). The group decision-making rule should be used to get a collective agreement on the relationship between each pair of elements such as A and B. Interpretive Structural Modeling (ISM) logic performs based on nonparametric methods and modes in frequencies. The achievement matrix is obtained by converting its interactive structural matrix to a double-value matrix of zero and one. Once the initial achievement matrix is obtained, its internal consistency must be established. One possible strategy for the calculation of different paths of i to j is to obtain the T Achievement matrix. The T achievement matrix is adapted using the following Boolean laws [35]:

$$\begin{aligned} &0+0=0\\ &0+1=1; \quad 1+0=1\\ &1+1=1 \end{aligned} \tag{3.1}$$

So, to calculate the achievement matrix (T) we have:

$$T=(I+D)^{n-1}; \quad t_{ij}=\begin{cases} 1, & \text{If there is a path from variable 1 to variable 2} \\ 0, & \text{otherwise} \end{cases} \tag{3.2}$$

To determine the relationships and level of the criteria, the set of outputs and inputs of each criterion must be extracted from the received matrix. The set of outputs includes the criteria themselves and the criteria that affect them. After data collection, the meta-synthesis method was used to combine the studies obtained from the systematic review and interviews conducted on the research topic. Also, in the quantitative part, structural equation modelling methods, i.e., the partial least squares (PLS) method, were used to test the measurement model and research hypotheses.

4 Findings

4.1 Grounded theory-based analysis of interviews

This section uses 19 theoretical interviews to design a model of technological business accelerators in communication service companies. Before starting the qualitative analysis, data must be analyzed simply. To this aim, this study investigated the interviews in the form of tables after listening to interview texts and examining the notes, the general concept of the interviews was obtained. The concepts were reduced to 13 categories and 197 codes. Next, repetitive sentences were removed. Thus, 11 categories and 52 selective codes were enumerated. In the end, basic themes were classified by using the software. After extracting the codes by Atlas TI software in a back-and-forth process and converting the codes into more conceptual factors in each interview, as well as examining other key factors, the model of technological business accelerators in telecommunication service companies was presented (Fig. 1).

4.2 Screening using Fuzzy Delphi technique

Using the grounded theory analyses of specialized interviews, 52 codes were finally determined. To ensure the significance of the identified indicators and select the final indicators, Fuzzy Delphi methods were used. Also, triangular fuzzy numbers were used for fuzzification. Expert views about the significance of each of the indicators were gathered based on a seven-degree fuzzy spectrum. The views of 15 exerts are also given in Table 1.

In the next stage, expert views have to be summed up. Different methods were proposed to collect n respondents' opinions. In fact, these collection methods are experimental methods that have been proposed by various researchers. For example, a common method for collecting a set of triangular fuzzy numbers is considered as minimum l , geometric mean m and maximum u:

$$F_{AGR}=\Big\{\min\{l\},\prod\{m\},\max\{u\}\Big\} \tag{4.1}$$

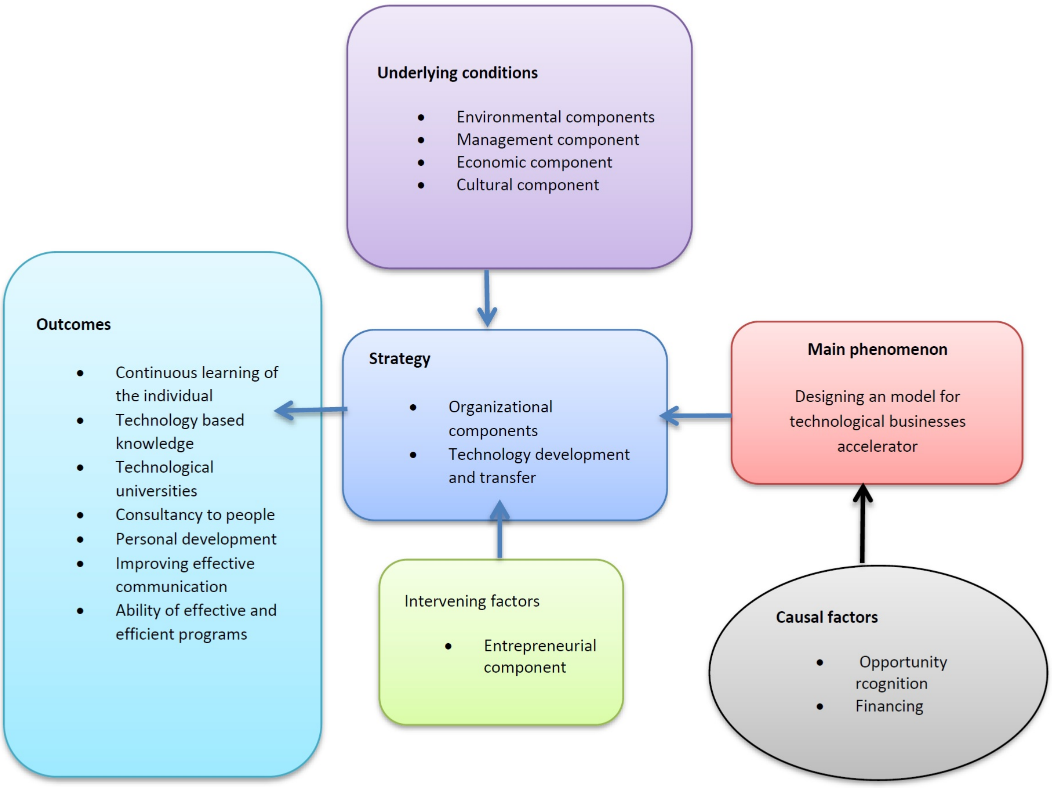

Figure 1: The final model of the study

Table 1: Fuzzification of the views of expert panel for each open coding

	Expert 1	Expert 2	Expert 3	···	Expert 15
Q1	(0.9, 1, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q2	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	···	(0.75, 0.9, 1)
Q3	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	···	(0.9, 1, 1)
Q4	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q5	(0.9, 1, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q6	(0.1, 0.3, 0.5)	(0.75, 0.9, 1)	(0.9, 1, 1)	···	(0.5, 0.75, 0.9)
Q7	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	···	(0.9, 1, 1)
Q8	(0.9, 1, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	···	(0.9, 1, 1)
Q9	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	···	(0.5, 0.75, 0.9)
Q10	(0.75, 0.9, 1)	(0.1, 0.3, 0.5)	(0, 0.1, 0.3)	···	(0.9, 1, 1)
Q11	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q12	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.5, 0.75, 0.9)	···	(0.75, 0.9, 1)
Q13	(0.75, 0.9, 1)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	···	(0.9, 1, 1)
Q14	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q15	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.5, 0.75, 0.9)	···	(0.5, 0.75, 0.9)
Q16	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q17	(0.5, 0.75, 0.9)	(0.3, 0.5, 0.75)	(0.5, 0.75, 0.9)	···	(0, 0, 0.1)
Q18	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	···	(0.9, 1, 1)
Q19	(0.9, 1, 1)	(0.75, 0.9, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q20	(0.9, 1, 1)	(0.9, 1, 1)	(0.5, 0.75, 0.9)	···	(0.75, 0.9, 1)
Q21	(0.9, 1, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q22	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.3, 0.5, 0.75)	···	(0.9, 1, 1)
Q23	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	···	(0.75, 0.9, 1)
Q24	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)	···	(0.75, 0.9, 1)
Q25	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	···	(0.9, 1, 1)
Q26	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	(0.9, 1, 1)	···	(0.5, 0.75, 0.9)
Q27	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q28	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	···	(0.9, 1, 1)
Q29	(0.9, 1, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q30	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	···	(0.9, 1, 1)

Q31	(0.1, 0.3, 0.5)	(0.75, 0.9, 1)	(0.9, 1, 1)	···	(0.5, 0.75, 0.9)
Q32	(0.9, 1, 1)	(0.75, 0.9, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q33	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	···	(0.9, 1, 1)
Q34	(0.9, 1, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q35	(0.9, 1, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	···	(0.9, 1, 1)
Q36	(0.9, 1, 1)	(0.9, 1, 1)	(0.5, 0.75, 0.9)	···	(0.75, 0.9, 1)
Q37	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	···	(0.5, 0.75, 0.9)
Q38	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.75, 0.9, 1)
Q39	(0.75, 0.9, 1)	(0.1, 0.3, 0.5)	(0, 0.1, 0.3)	···	(0.9, 1, 1)
Q40	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q41	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q42	(0.9, 1, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	···	(0.9, 1, 1)
Q43	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.5, 0.75, 0.9)	···	(0.75, 0.9, 1)
Q44	(0, 0, 0.1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.75, 0.9, 1)
Q45	(0.75, 0.9, 1)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	···	(0.9, 1, 1)
Q46	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q47	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q48	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q49	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.5, 0.75, 0.9)	···	(0.5, 0.75, 0.9)
Q50	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	···	(0.75, 0.9, 1)
Q51	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)	···	(0.9, 1, 1)
Q52	(0, 0, 0.1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	···	(0.75, 0.9, 1)

$$F_{AGR} = \left\{ \min\{l\}, \left\{ \frac{\sum m}{n} \right\}, \max\{u\} \right\} \tag{4.2}$$

$$F_{AVE} = \left(\left\{ \frac{\sum l}{n} \right\}, \left\{ \frac{\sum m}{n} \right\}, \left\{ \frac{\sum u}{n} \right\} \right) \tag{4.3}$$

Each triangular fuzzy number obtained from the collection of experts' views on the j^{th} index is represented as follows:

$$\begin{aligned} \tau_j &= (L_j, M_j, U_j) \\ L_j &= \min(X_{ij}) \\ M_j &= \sqrt[n]{\prod_{i=1}^{n} X_{ij}} \\ U_j &= \max(X_{ij}) \end{aligned} \tag{4.4}$$

where the i-index refers to an 'expert's opinion, so that:

- X_{ij} : The value of assessment of the i^{th} expert of the j^{th} index
- L_j : The minimum value of assessment for the j^{th} index
- M_j : The geometric mean of the experts' assessment of the performance of the j^{th} index
- U_j : The maximum value of assessments for the j^{th} index

In this study, we used the fuzzy mean method. The aggregated mean of triangular and trapezoidal fuzzy numbers can usually be summarized by a single value which is the best-related mean. This operation is called defuzzification.

There are several methods for defuzzification. In most cases, the following simple method is used for defuzzification:

$$x_m^1 = \frac{L + M + U}{3} \tag{4.5}$$

Another simple method for defuzzification of the mean of fuzzy triangular numbers is as follows:

$$\begin{aligned} F_{ave} &= (L, M, U) \\ x_m^1 &= \frac{L + M + U}{3}; \quad x_m^2 = \frac{L + 2M + U}{4}; \quad x_m^3 = \frac{L + 4M + U}{6} \\ \text{Crisp number} &= Z* = \max(x_{\max}^1, x_{\max}^2, x_{\max}^3) \end{aligned} \tag{4.6}$$

$x^i_{\max}$ Values do o not differ much and are always numerically close to the value of M. M is the mean of the sum of possible m values from different triangular fuzzy numbers. However, the definite value of the largest amount calculated $x^i_{\max}$ will be considered. In this study, the center of area method is used for defuzzification as follows:

$$DF_{ij} = \frac{[(u_{ij} - l_{ij}) + (m_{ij} - l_{ij})]}{3} + l_{ij} \tag{4.7}$$

The table gives the average fuzzy and the fuzzified outputs of the values of the indicators. The de-fuzzified values of larger than 0.7 are acceptable, as any indicator with a score of less than 7 is rejected. In the first stage of fuzzy Delphi, the definite values of all factors were obtained to be higher than 0.7. Therefore, no factors were removed. The fuzzy Delphi analysis of the identified factors continued in the second round. In this stage, 52 indicators were evaluated based on the views of 15 experts. In this round, none of the factors were eliminated. In the second stage, no item was eliminated, indicating the end of the Delphi rounds. In general, an approach to end the Delphi is to compare the average scores of the items of the last two rounds. Meanwhile, polling process is discontinued if the difference between the two stages is smaller than the threshold limit of very low (0.2).

Table 2: Differences of round two and three results

	Round two results	**Round three results**	**Difference**	**Result**
Q1	0.794	0.752	0.042	Agreement
Q2	0.925	0.872	0.053	Agreement
Q3	0.875	0.778	0.097	Agreement
Q4	0.776	0.738	0.038	Agreement
Q5	0.904	0.777	0.127	Agreement
Q6	0.738	0.813	0.075	Agreement
Q7	0.928	0.803	0.125	Agreement
Q8	0.777	0.928	0.151	Agreement
Q9	0.803	0.890	0.087	Agreement
Q10	0.890	0.778	0.112	Agreement
Q11	0.918	0.813	0.105	Agreement
Q12	0.866	0.918	0.052	Agreement
Q13	0.932	0.731	0.201*	Agreement
Q14	0.847	0.866	0.019	Agreement
Q15	0.896	0.708	0.188	Agreement
Q16	0.896	0.778	0.118	Agreement
Q17	0.752	0.932	0.18	Agreement
Q18	0.708	0.847	0.139	Agreement
Q19	0.778	0.827	0.049	Agreement
Q20	0.932	0.896	0.036	Agreement
Q21	0.847	0.752	0.095	Agreement
Q22	0.827	0.932	0.105	Agreement
Q23	0.896	0.872	0.024	Agreement
Q24	0.932	0.918	0.014	Agreement
Q25	0.744	0.731	0.013	Agreement
Q26	0.794	0.866	0.072	Agreement
Q27	0.925	0.708	0.217*	Agreement
Q28	0.875	0.778	0.097	Agreement
Q29	0.781	0.932	0.151	Agreement
Q30	0.776	0.847	0.071	Agreement
Q31	0.904	0.827	0.077	Agreement)
Q32	0.738	0.896	0.158	Agreement
Q33	0.928	0.752	0.176	Agreement
Q34	0.777	0.708	0.069	Agreement
Q35	0.803	0.778	0.025	Agreement
Q36	0.847	0.932	0.085	Agreement
Q37	0.827	0.847	0.02	Agreement
Q38	0.896	0.827	0.069	Agreement
Q39	0.752	0.896	0.144	Agreement
Q40	0.932	0.932	0	Agreement
Q41	0.872	0.744	0.128	Agreement
Q42	0.892	0.794	0.098	Agreement
Q43	0.928	0.925	0.003	Agreement
Q44	0.761	0.875	0.114	Agreement
Q45	0.733	0.781	0.048	Agreement
Q46	0.744	0.776	0.032	Agreement

Q47	0.794	0.904	0.11	Agreement
Q48	0.925	0.738	0.187	Agreement
Q49	0.875	0.928	0.053	Agreement
Q50	0.776	0.777	0.001	Agreement
Q51	0.904	0.803	0.101	Agreement
Q52	0.738	0.847	0.109	Agreement

As Table 2 shows, the difference in all cases is smaller than 0.2; thus, Delphi rounds can be finished. Kendall's coefficient of concordance can be used to calculate the concordance of expert views.

Table 3: Kendall's coefficient of concordance

	Number of indicators	**Number of experts**	**Kendall's coefficient of concordance**	**Freedom degree**	**Sig.**
Second round	52	15	0.660	51	0.000
Third round	52	15	0.745	51	0.000

According to Table 3, Kendall's coefficient in the second round was 0.660, indicating the unity of expert views at a medium level. Also, the significance of 0.000 indicates the reliability of the results a 95% confidence. As a consequence, disregard of the indicators scoring below 0.7, other indicators were used to be studied in the second round. Kendall's coefficient in the third round was 0.745, indicating the unity of expert views at a good level. The significance of 0.001 also suggests the reliability of the results at 95%. Also, the average scores of all items was 0.7, indicating the closeness of the views. Thus, the Delphi technique discontinued and the identified indicators were used for the final analysis.

4.3 Interpretive structural analysis

To analyze data, interpretive structural modeling (ISM) was used in MICMAC software. The first step in structural-interpretive modeling is to calculate the internal relations of the indicators. To reflect the interrelationships of the indictors, expert vies were used. Study components are coded as given in Table 4.

Table 4: Main component symbolization

Symbols	**Variable**
C1	Opportunity recognition
C2	Managerial components
C3	Cultural components
C4	Coaching
C5	Technology development and transfer
C6	Entrepreneurship component
C7	Technological entrepreneurship
C8	Organizational factors
C9	Environmental component
C10	Financing
C11	Economic components

The matrix obtained in this stage indicates which variable affects or is affected by other variables. A structural self-interactive matrix is made of study entries and indicators and their comparison using the four states of conceptual relations. Data obtained are summarized based on the interpretive structural modelling methods, which finally help form the structural self-interactive matrix. Then, the resulting matrix is obtained from the conversion of a structural self-interactive matrix into a two-value zero and one matrix. In the resulting matrix, the entries of the main diameter are equal. After the primary access matrix is obtained, transitivity is inserted into variable relations to obtain the final access matrix. This is a square matrix whose entries are one when every element has access to any length, otherwise, it is zero. To obtain an access matrix, use the Euler Theory. According to this theory, the adjacency matrix is added to the single matrix. This matrix is powered to n if matrix entries do not change. The final access matrix of the identified indicators is given in Table 5.

4.3.1 Determining relations and leveling dimensions and indicators

To determine the relations and to level the criteria, a set of outputs and inputs of each criterion from the matrices received should be extracted. The set of outputs includes the criterion itself and the criteria that affect it. The set of inputs includes the criterion and the criteria that affect it. Then, a set of two-way relations of the criteria is

Table 5: Final access matrix of the identified indicators

0	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
C1	1	1	1	1	1	1	1	1	1	1	1
C2	0	1	1	1	1	1	1	1	1	1	1
C3	0	1	1	1	1	1	1	1	1	1	1
C4	0	0	0	1	0	0	1	0	0	0	0
C5	0	0	0	1	1	0	1	1	0	0	0
C6	1	0	0	1	1	1	1	1	1	0	0
C7	0	0	0	1	0	0	1	0	0	0	0
C8	0	0	0	1	1	0	1	1	0	0	0
C9	0	0	0	1	1	1	1	1	1	0	0
C10	1	1	1	1	1	1	1	1	1	1	1
C11	0	1	1	1	1	1	1	1	1	0	1

determined. After determining the access and prerequisite sets, the commonality of the two sets is calculated. The first variable to be the commonality of the two sets as equal to the accessible set of outputs is the first level. Therefore, the elements of the first level will have the highest effect on the model. After determining the level, the criterion whose level is known will be eliminated from the entire set and again form the set of inputs and outputs, thus yielding the level of the next variable.

Table 6: Determining the first level in the ISM hierarchy

Symbol	Inputs	Outputs	Commonality	Levels
C1	C1-C10	C1-C2-C3-C4-C5-C6-C7-C8-C9-C10-C11	C1-C10	1
C2	C1-C10-C2-C3-C11	C2-C3-C4-C5-C6-C7-C8-C9 -C11	C2-C3-C11	2
C3	C1-C10-C2-C3-C11	C2-C3-C4-C5-C6-C7-C8-C9 -C11	C2-C3-C11	2
C4	C1-C2-C3-C4-C5-C6-C7-C8-C9-C10-C11	C4-C7	C4-C7	5
C5	C1-C10-C2-C3-C11-C6-C9-C5-C8	C4-C5-C7-C8	C5-C8	4
C6	C1-C10-C2-C3-C11-C6-C9	C4-C5-C6-C7-C8-C9	C6-C9	3
C7	C1-C2-C3-C4-C5-C6-C7-C8-C9-C10-C11	C4-C7	C4-C7	5
C8	C1-C10-C2-C3-C11-C6-C9-C5-C8	C4-C5-C7-C8	C5-C8	4
C9	C1-C10-C2-C3-C11-C6-C9	C4-C5-C6-C7-C8-C9	C6-C9	3
C10	C1-C10	C1-C2-C3-C4-C5-C6-C7-C8-C9-C10-C11	C1-C10	1
C11	C1-C10-C2-C3-C11	C2-C3-C4-C5-C6-C7-C8-C9 -C11	C2-C3-C11	2

Therefore, the C1-C10 variables are first-level variables. After identifying first-level variables, these variables will be eliminated and a set of inputs and outputs will be calculated without considering first-level variables. A commonality set was identified and the variables whose commonality equalled the set of inputs were selected as the second-level variables.

C2-C3-C11 variables are second-level variables.

C6-C9 variables are third-level variables.

C5-C8 variables are fourth-level variables.

C4-C7 variables are fifth-level variables.

The variables of the final model of the identified variable levels are illustrated in the figure below. This image only illustrates the significant relations of the elements of each level on the elements of the following level and also the internally significant relations of the elements of each column.

4.4 Partial square analysis

Data analysis is a multi-stage process that collect, summarize, categorize and finally process data to analyze the interrelationship between data for model testing.

4.4.1 Descriptive statistics (Descriptive analysis of study constructs)

In general, descriptive statistics include methods by which data gathered can be processed and summarized. This kind of statistics simply describes the population or sample under study and is aimed at calculating population parameters or samples. In the descriptive statistics section, data are analyzed by using central indices such as mean, and dispersion indicates such as SD, range of variations, minimum and maximum.

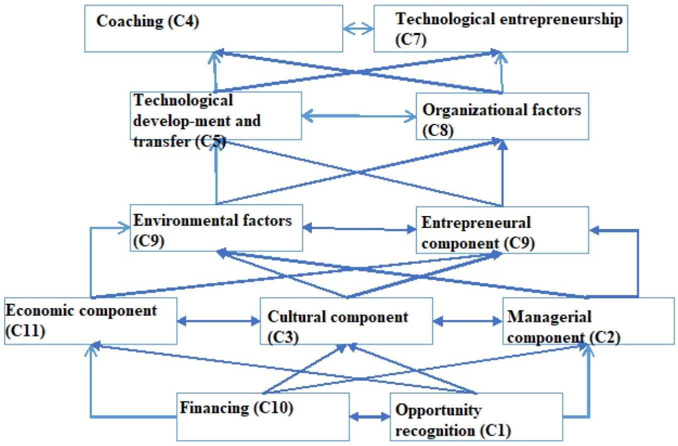

Figure 2: Basic model developed by ISM method

Table 7: Descriptive statistics of study variables

Variables	No.	Mean	Skewness	Kurtosis	Variance	Min.	Max.
Opportunity recognition	384	3.790	0.766	0.002	0.490	2	5
Managerial components	384	3.546	1.461	-0.584	0.446	1.67	5
Cultural components	384	4.0842	-0.058	-0.263	0.231	2.67	5
Coaching	384	3.825	-0.216	0.566	0.225	2	5
Technology development and transfer	384	3.6729	-0.496	0.314	0.339	2.75	5
Entrepreneurship component	384	4.2229	-0.625	-0.47	0.38	3	5
Technological entrepreneurship	384	4.0938	0.018	-0.032	0.192	2.75	5
Organizational factors	384	3.8734	-0.883	0.163	0.465	2.5	5
Environmental component	384	3.7405	-0.301	-0.171	0.473	2	5
Financing	384	4.3938	-0.241	-0.621	0.302	3	5
Economic components	384	4.1	-0.938	0.134	0.319	3	5

Opportunity recognition held a mean of 3.790 and a variance of 0.490. the rage of variations is also seen based on minimum and maximum of 3. The descriptive statistics of other variables is also noted in the table.

4.4.2 Partial least squares (PLS) technique and hypothesis testing

The present study used structural equation modelling methods, i.e., partial least squares to test the measurement model and study hypotheses. Each of the study hypotheses was separately analyzed by using the PLS technique. In the end, the general model of the study was tested by using the same technique. In the PLS technique, some issues are key:

1. The power of the relationship between the latent factor and the observable variable is shown by the factor loading. A factor loading value ranges between zero and one. In the measurement model, if the value of a factor loading between an item and a related dimension is smaller than 0.4, the indicator (questionnaire item) is eliminated from the model and, the items with factor loadings of 0.3 to 0.7 should be examined to be eliminated, and the threshold value for the factor loading is 0.7 and higher.
2. When the variables are correlated, a significance test should be made. To examine the significance of the observed correlation, bootstrapping and Jackknife cross-validation methods were used. At the error level of 5%, if the bootstrapping figure is larger than 1.96, the observed correlation is significant.

In sum, the relations between the variables in the PLS technique are divided into two groups:

1. **External model:** The external model is equivalent to the measurement model (confirmatory factor analysis) in structural equations and shows the relationship between latent and manifest variables.
2. **Internal model:** The internal model is equivalent to the structural model (path analysis) in structural equations and examines the relations between latent variables.

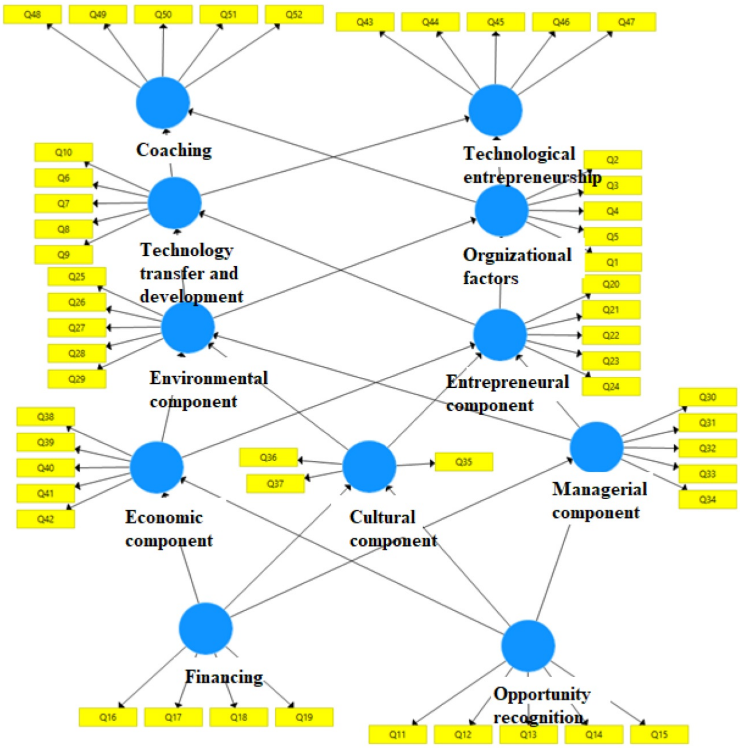

Figure 3: Basic model designed in the software

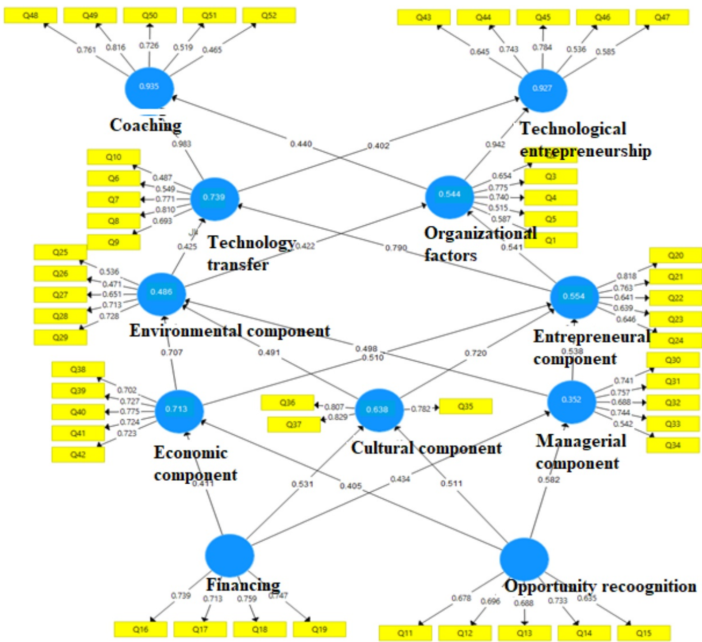

Figure 4: Overall factor loading of the study model

The standard factor loading of the effects of opportunity recognition on managerial components was 0.582. Also, the value of the t statistics was 6.261; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of opportunity recognition on cultural components was 0.511. Also, the value of the t statistics was 4.689; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of opportunity recognition on economic components was 0.405. Also, the value of the t statistics was 5.251; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of financing on economic components was 0.411. Also, the value of the t statistics was 5.713; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of financing on cultural components was 0.531. Also, the value of the t statistics was 6.125; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of financing on managerial components was 0.434. Also, the value of the t statistics was 8.767; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of economic components on environmental components was 0.707. Also, the value of the t statistics was 6.977; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of economic components on entrepreneurial components was 0.510. Also, the value of the t statistics was 8.867; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of cultural components on environmental components was 0.491. Also, the value of the t statistics was 5.624; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of cultural components on entrepreneurial components was 0.720. Also, the value of the t statistics was 6.952; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of managerial components on environmental components was 0.498. Also, the value of the t statistics was 6.176; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of managerial components on entrepreneurial components was 0.538. Also, the value of the t statistics was 4.948; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of environmental components on technology transfer components was 0.425. Also, the value of the t statistics was 9.910; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of environmental components on organizational components was 0.422. Also, the value of the t statistics was 8.356; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of entrepreneurial component on technology transfer components was 0.790. Also, the value of the t statistics was 4.557; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of entrepreneurial component on organizational components was 0.541. Also, the value of the t statistics was 3.127; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of technology transfer on coaching components was 0.963. Also, the value of the t statistics was 112.286; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of technology transfer on technological entrepreneurship components was 0.402. Also, the value of the t statistics was 8.820; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of organizational factors on coaching components was 0.440. Also, the value of the t statistics was 8.774; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of organizational factors on technological entrepreneurship was 0.942. Also, the value of the t statistics was 71.588; therefore, the hypothesis was confirmed at a confidence rate of 95%.

5 Discussion and conclusion

The goal of this study was to present a model of technological business accelerator model in communication service companies. The results revealed 11 categories and 52 selective codes. In this study, the strategic accelerator factors of technological businesses in communication service companies included organizational and technology transfer and development components. If organizational interactions are consolidated within the body of technological business and the motivational system, they can increase the quality of the technological business accelerators in telecommunication companies. Bailetti [3] demonstrated that technology transfer and transformation can change the types of data in entrepreneurship, thus yielding better use of entrepreneurship and technological business. Researchers have demonstrated that technological businesses have the highest effects on investment aspects of various dimensions. From this point of view, they have maintained that social dimensions are affected by technological businesses, which is in line with the findings of Cohen and Hochberg [10] and Ying Huang and Hsieh [36]. In this connection, Research and Development Units in an organization can be specially focused on as a body that secures expert manpower in

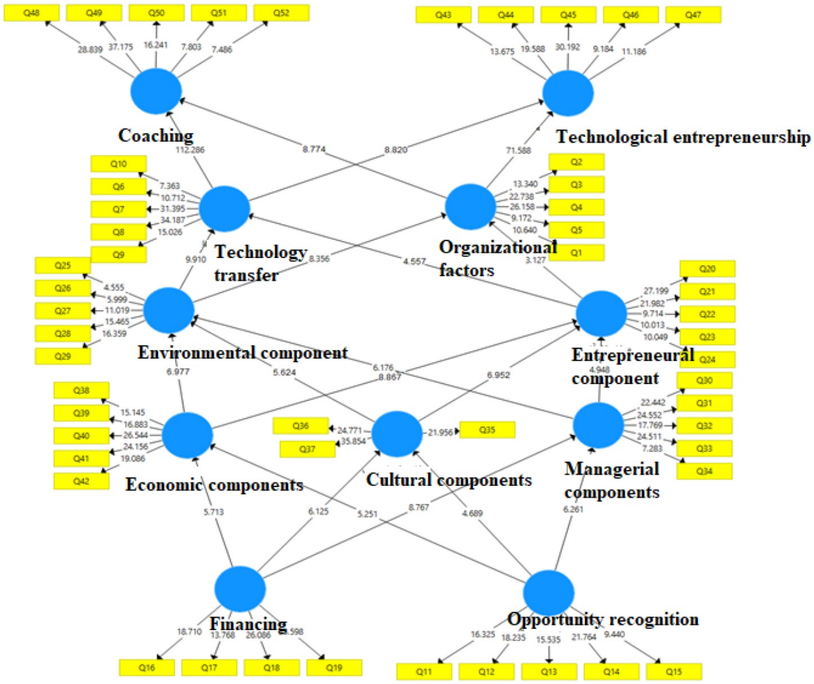

Figure 5: Bootstrapping T statistics and study model

proportionate to R & D goals. This makes a step towards the development of technological business accelerators in telecommunication service companies.

The intervening factor in this study was entrepreneurship, which is aimed to help discover and utilize opportunities. Therefore, factors related to the discovery of opportunities in the market and technology are considered in the process of technological businesses. Meanwhile, factors related to utilizing opportunities are considered in financial resources and human resources; also, previous findings suggested that technology, budget, amortization and markets were major factors determining technological businesses [37].

Although technology-based entrepreneurship significance is on the rise and technology-driven businesses have attracted the attention of many media and policymakers, research knowledge is still limited. Recent studies have also provided some concepts, responses and ideas; however, the need for more research is strongly felt. Underlying factors of technological business accelerators in telecommunication service companies include managerial, environmental, cultural and economic components. The managerial dimension refers to activities performed by people and businesses to develop value. In this dimension, opportunities are identified and then utilized. The activities related to technological businesses won't succeed if they are not endorsed by managers and there is no planning to realize the process of technological entrepreneurship. Therefore, managerial stability and the presence of managers with a high level of knowledge, expertise and experience may lead to the development of knowledge-based businesses. These factors are in line with the findings of Bigliarddi et al. [5].

Environmental components were also identified as other factors affecting technological business accelerators in telecommunication service companies. Environmental components consisted of the government, universities and research centres, as well as consultants. The government category includes budget, policy-making, governance roles and sanctions. Budgets offered by the government for innovation and those that are based on opportunity and the role of policy-making activities may overshadow knowledge-based businesses. Thus, environmental conditions and necessary budgets for assigning entrepreneurial activities will have significant effects on holding sessions workshops and conferences. This finding is in line with those of Herrington et al. [20] and Battistella et al. [4]. Concerning cultural components, researchers have argued that people's cognitive abilities, prior knowledge, personality traits, knowledge acquisition, etc. will be facilitated by intercultural training and thus accelerate technological business activities. Their personality traits facilitate their foreign language skills, motivation and prior experiences, and the development of reciprocally cultural skills at high quality. Also, the world leaders' reactions, reciprocal cultural experiences and development opportunities will be affected. The results are in line with those of Herrington et al. [20] and Battistella et al. [4]. This study indicated that the individual distinctions of global leaders could promise accomplishments for intercultural competence.

The causal factors of technological businesses in telecommunication services companies consist of financing and opportunity recognitions, Financing as a technological business accelerator can include personal resources, business angels, individual investment, multiple investments, corporate joint ventures, banking joint ventures, and government and academic investment. In financing, not only risk is divided but also it is not repaid like loans; rather the investor awaits to obtain a percentage of future proceeds, the most common of which include business angels, partners, large joint stock companies and joint venture companies. Researchers have stated that the identification and utilization of existing opportunities in businesses serve as the most important capacity of a successful entrepreneur. Meanwhile, opportunity recognition refers to the process of perceiving a new profitable business or a product or service. This means unless an opportunity is recognized no utilization will be achieved. Many entrepreneurs find opportunities to utilise innovative applications through new technologies and combining technologies. Policy changes and modifications in the legal context will also lead to changes. These findings are in line with those of Ghorashi [14] and Radojevich-Kelly and Hoffman [31]. After screening using the fuzzy Delphi technique, 11 main categories were identified. According to the interpretive structural model, coaching and technological entrepreneurship were ranked first.

The standard factor loading of the effects of opportunity recognition on managerial components was 0.582. Also, the value of the t statistics was 6.261; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of opportunity recognition on cultural components was 0.511. Also, the value of the t statistics was 4.689; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of opportunity recognition on economic components was 0.405. Also, the value of the t statistics was 5.251; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of financing on economic components was 0.411. Also, the value of the t statistics was 5.713; therefore, the hypothesis was confirmed at a confidence rate of 95%.

The standard factor loading of the effects of financing on cultural components was 0.531. Also, the value of the t statistics was 6.125; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of financing on managerial components was 0.434. Also, the value of the t statistics was 8.767; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of economic components on environmental components was 0.707. Also, the value of the t statistics was 6.977; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of economic components on entrepreneurial components was 0.510. Also, the value of the t statistics was 8.867; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of cultural components on environmental components was 0.491. Also, the value of the t statistics was 5.624; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of cultural components on entrepreneurial components was 0.720. Also, the value of the t statistics was 6.952; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of managerial components on environmental components was 0.498. Also, the value of the t statistics was 6.176; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of managerial components on entrepreneurial components was 0.538. Also, the value of the t statistics was 4.948; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of environmental components on technology transfer components was 0.425. Also, the value of the t statistics was 9.910; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of environmental components on organizational components was 0.422. Also, the value of the t statistics was 8.356; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of entrepreneurial components on technology transfer components was 0.790. Also, the value of the t statistics was 4.557; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of entrepreneurial components on organizational components was 0.541. Also, the value of the t statistics was 3.127; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of technology transfer on coaching components was 0.963. Also, the value of the t statistics was 112.286; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of technology transfer on technological entrepreneurship components was 0.402. Also, the value of the t statistics was 8.820; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of organizational factors on coaching components was 0.440. Also, the value of the t statistics was 8.774; therefore, the hypothesis was confirmed at a confidence rate of 95%. The standard factor loading of the effects of organizational factors on technological entrepreneurship was 0.942. Also, the value of the t statistics was 71.588; therefore, the hypothesis was confirmed at a confidence rate of 95%.

As stated above, managers and policymakers are suggested to adopt organizational strategies to design and adjust products and investments for the market and supply and demand cycles that would meet the fast and future changes and meet the priorities of the organization, which will help improve organizational function. They are also suggested to use purposeful training to educate experts who can offer views in this regard. Thus, creating skill-training centres can promote individual skills and remove the problem of unemployment and the problem of small and medium-sized businesses, i.e., the lack of manpower. Finally, the government should support domestic production, modify tax laws, and insurance laws impose supportive regulations and optimize technological policies, financial policies and market policies to develop technological businesses. Every project faces hurdles and limitations during its working stages, some of which can be solved, while others cannot, which may cause undesirable and unwanted effects on the quality and efficiency of the project. The limitations of this study include the lack of previous literature on this topic, and since this study was performed in a limited period and during the COVID-19 pandemic, its results may change over time.

References

[1] T. Abouei, S. Shojaei, F. Azma, and H. Aghajani, *Ranking factors affecting entrepreneurship training to set up knowledge-based businesses in accelerators deployed in academic growth centers*, Educ. Manag. Res. **11** (2019), no. 41, 199–213.

[2] K. Andriushchenko, A. Liezina, O. Kuchai, and H. Petukhova, *Corporate university as a business accelerator in the field of education*, World, **3** (2022), no. 3, 657–671.

[3] T. Bailetti, *Technology entrepreneurship: overview, definition, and distinctive aspects*, Technol. Innov. Manag. Rev. **2** (2012), no. 2.

[4] C. Battistella, A.F. De Toni, and E. Pessot, *Open accelerators for start-ups success: a case study*, Eur. J. Innov. Manag. **20** (2017), no. 1, 80–111.

[5] B. Bigliardi, A.I. Dormio, and F. Galati, *The adoption of open innovation within the telecommunication industry*, Eur. J. Innov. Manag. **15** (2012), no. 1, 27–54.

[6] M.J. Bliemel, *Authentic learning experiences in entrepreneurship: engaging external stakeholders*, UNSW Business School Research Paper No. 2016MGMT02, Available at SSRN: https://ssrn.com/abstract=2826331, (2016), 2–5.

[7] S.M. Breznitz and Q. Zhang, *Fostering the growth of student start-ups from university accelerators: An entrepreneurial ecosystem perspective*, Ind. Corpo. Change **28** (2019), no. 4, 855–873.

[8] S. Cohen and C.B. Bingham, *How to accelerate learning: Entrepreneurial ventures participating in accelerator programs*, Acad. Manag. Proc. New York: Acad. Manag. **2013** (2013), no. 1, 14803.

[9] S. Cohen, D.C. Fehder, Y.V. Hochberg, and F. Murray, *The design of startup accelerators*, Res. Policy **48** (2019), no. 7, 1781–1797.

[10] S. Cohen and Y.V. Hochberg, *Accelerating startups: The seed accelerator phenomenon*, SSRN: https://ssrn.com/abstract=2418000, (2014).

[11] E. Dadjou and A. Mahadavi, *Effects of accelerator in relation to industry and university*, Manag. Entrepr. Stud. **3** (2017), 15–32.

[12] C.S. Dempwolf, J. Auer, and M. D'ippolito, *Innovation accelerators: Defining characteristics among startup assistance organizations*, Small Bus. Admin. **10** (2014), no. 1, 44.

[13] A.A. Fink, M. Klöckner, T. Räder, and S.M. Wagner, *Supply chain management accelerators: Types, objectives, and key design features*, Transport. Res. Part E: Logistics Transport. Rev. **164** (2022), 102728.

[14] H. Ghorashi, *Challenges of the lean startup method: Entrepreneurial knowledge management during the BML-loop*, Bachelor's thesis, University of Twente, 2015.

[15] V.M. Golomb, *Accelerators are the New Business School*, Tech Crunch, 2015.

[16] J. Gonzalez-Uribe and M. Leatherbee, *The effects of business accelerators on venture performance: Evidence from start-up Chile*, Rev. Financ. Stud. **31** (2018), no. 4, 1566–1603.

[17] B.L. Hallen, C.B. Bingham, and S. Cohen, *Do accelerators accelerate? The role of indirect learning in new venture development*, Role Indirect Learn. New Venture Dev. **2016** (2016).

[18] N. Hasanpour and H. Aghajani, *Presenting the model of university accelerator formation using psychological preparation for entrepreneurship (Experimental evidence: Representative universities.)*, Sci. Res. Quart. Entrepr. Dev. **15** (2023), no. 1, 81–100.

[19] N. Hassanpour, H. Aghajani, D. Kiakejuri, and M.J. Taghipurian Gilani, *Systematic review of individual factors affecting the performance of accelerators*, Res. J. Execut. Manag. **12** (2020), no. 23, 13–40.

[20] J. Herrington, J. Parker and D. Boase-Jelinek, *Connected authentic learning: Reflection and intentional learning*, Austr. J. Educ. **58** (2014), no. 1, 23–35.

[21] H. Kuster and O. Rezende, *Accelerating start-ups' internationalisation through networks: A comparative study*, Int. J. Strat. Bus. Allian. **7** (2022), no. 1, 1–22.

[22] M. Lackéus and K.W. Middleton, *Venture creation programs: bridging entrepreneurship education and technology transfer*, Educ. Train. **57** (2015), no. 1, 48–73.

[23] D. Mahmoudzadeh, *Identification of the ecosystem elements of basic space businesses*, Human Islamic Studi. **27** (2019), no. 5, 12–20.

[24] M.P. Miles, H. de Vries, G. Harrison, M. Bliemel, S. De Klerk, and C.J. Kasouf, *Accelerators as authentic training experiences for nascent entrepreneurs*, Educ. Train. **59** (2017), no. 7/8, 811–824.

[25] P. Miller and K. Bound, *The startup factories*, NESTA, http://www.nesta.org.uk/library/documents/StartupFactories.pdf, 2011.

[26] A. Mobayyeni Dehkordi, J. Yadollhi Farsi, K. Sakhdari and A. Khaleghi, *Identification of opportunity evaluation criteria in accelerators*, Technol. Dev. Manag. Quart. **6** (2018), no. 2, 79–108.

[27] S.P. Nogueira, *Winning the startup game: A study on the design of European startup accelerators*, J. Technol. Transfer **29** (2022), no. 1, 55–82.

[28] M.E.S. Noronha, C.D. Rodrigues, L.R. Longo, and I. Avrichir, *An analysis of international scientific production on business accelerators from 1990 to 2019*, Iberoamerican J. Entrepr. Small Bus. **11** (2022), no. 1, 1–27.

[29] S. Nosova, A. Norkina, O. Medvedeva, A. Abramov, S. Makar, N. Lozik, and G. Fadeicheva, *Artificial intelligence technology as an economic accelerator of business process*, In: V.V. Klimov and D.J. Kelley, (eds) Biologically inspired cognitive architectures 2021, BICA 2021. Studies in Computational Intelligence, Springer, Cham, 2021.

[30] M.R. Parsanejad, *Examining the performance of US startup accelerators via the integrated approach of data coverage analysis and ideal planning*, Modiriat-e-Farda J. **18** (2019), no. 60, 61–76.

[31] N. Radojevich-Kelley and D.L. Hoffman, *Analysis of accelerator companies: An exploratory case study of their programs, processes, and early results*, Small Bus. Inst. J. **8** (2012), no. 2, 54–70.

[32] P. Roberts, S. Lall, R. Baird, E. Eastman, A. Davidson, and A. Jacobson, *What's working in startup acceleration: Insights from fifteen village capital programs*, The Aspen Institute and Emory University, 2016.

[33] T. Shenkoya, *A study of startup accelerators in Silicon Valley and some implications for Nigeria*, Afr. J. Sci. Technol. Innov. Dev. **13** (2021), no. 3, 303–314.

[34] K. Szczukiewicz and M. Makowiec, *Characteristics and specificities of local innovation accelerators: A case of Poland*, Sustainability **13** (2021), no. 4, 1689.

[35] M. Yazdani Paraei and L. Salimi, *Comparative comparison of media literacy curricula between Canada, Japan, and Iran*, New Dev. Educ. Manag. **2** (2021), no. 1, 76–100.

[36] H. Ying Huang and M.H. Hsieh, *The accelerated internationalization of born global firms: a knowledge transformation process view*, J. Asia Bus. Stud. **7** (2013), no. 3, 244–261.

[37] G. Zhang, X. Peng, and J. Li, *Technological entrepreneurship and policy environment: A case of China*, J. Small Bus. Enterpr. Dev. **15** (2008), no. 4, 733–751.

[38] R.D. Zuquetto, B.V. Martins, M.A.F. Santini, K. Facchin, and A. Balestrin, *Business accelerators: a systematic literature review*, ISPIM Conf. Proc. Int. Soc. Prof. Innov. Manag., 2021, pp. 1–14.