



Factors that influence training for entrepreneurial activity supported by technological and innovative resources

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ABSTRACT

Entrepreneurship 4.0 has created bridges, generated connections, gathering and adding productive, technological resources and physical efforts in the development of entrepreneurial activity [1]. In this sense, it is possible to infer that the adoption of Innovation and Information and Communication Technology (ICT) resources by the entrepreneur can, in general, improve the process of Entrepreneurial Education (EE). This article aims to understand some of the factors that directly influence training for entrepreneurship 4.0 as a new vector of growth and development in Brazilian regions. Methodologically, the development of the study took place from a broad survey of the literature on the evolution towards training for entrepreneurship 4.0 and data from a study with the participation of the main author carried out in Brazil adopting the statistical approach of Exploratory Factor Analysis (EFA) and supported by SPSS® version 19 software. The literature analysis and the application of the statistical method contributed to the identification of three factors (Competitive Advantage, Strategy and Entrepreneurial Profile), 41.7%, and, consequently, will serve as a guideline for EE training for entrepreneurship 4.0. Although conceived in a specific context, the instrument generated can be applied, with the necessary adjustments, in other national and international experiences.

Key words: Entrepreneurial Education; Entrepreneurship 4.0; Innovation; Information and communication technology.

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1 INTRODUCTION

The digital transformation of entrepreneurial work, which is the daily work of entrepreneurs, is an evolutionary phenomenon, based on practice rather than the result of rational design. The use of different digital tools are interrelated and depend on the characteristics, dynamics and learning of the surrounding environment. In this context, Entrepreneurial Education (EE) can be defined as a component that promotes successful competencies or skills, such as the adoption and use of technologies and innovations, to the entrepreneur([2];[3];[3]).

By promoting more dynamic, profitable and technologically efficient entrepreneurial practices, EE has been vigorously developed and gaining more and more attention from the various elements of the ecosystem - researchers, educational entities, organizations, governments, among others - in the world([4]);[3]).

Regarding the training conceived in the EE process, the various and multiple advances, innovations and the latent incorporation of information and communication technology resources that intend to favor the growth of interconnections, interactions and complementarities of the entrepreneur's operating environment, contributed to the beginning of a rupture of disconnected and independent teaching techniques towards more productive, agile, sustainable forms, seen as a “virtuous circle”, capable of promoting the economic progress of its actors ([5];[6]).

Considering the problems faced by the Covid 19 pandemic and its variants and observing the presented context, the new programs, the revisions, the modernization and the insertion of digital tools in the EE can be understood as improvements driven by the current digital or knowledge economy facilitating the decisions that permeate the lives, relationships, businesses of current entrepreneurs or the future entrepreneurial intention fostered in universities and other institutions ([7];[8];[9];[10],[11]).

The modernization and insertion of digital tools is known as Technological Orientation (OT), *technology push*. OT is an important strategic management practice and driving force in the development of innovative products and services based on new technologies ([12]; [13]). From the Resource-Based View (RBV) point of view, OT can be considered a specific valuable asset/internal resource that provides benefits to the organization ([14]). As a dimension of Entrepreneurial Orientation (EO), technological innovation can be incremental (i.e., making the process, product or service more efficient) or radical (i.e., starting from established practices and technologies to acquire new skills to make new products. or formulate new processes) ([15]; [16]).

Research on training for entrepreneurship 4.0 as a new vector for growth and development in Brazilian regions will allow reveal the importance of ICTs as essential socio-technical systems in terms of resources *to be adopted and used efficiently by the actors studied in the project. The impact of this contribution is based on the fact that, since the adoption and use of ICT resources by entrepreneurs is a broader transition to a digital economy and not an isolated phenomenon*, study them in terms of promoting their efficiency, will help us to understand that such ventures do not arise from the new, but from conflicts in technical systems, organizational structures, practices, user preferences and behavior patterns, which require projects of full educational compatibility with previous styles, evolving and developing.

Investigating training for entrepreneurship 4.0 as a new vector of growth and development in Brazilian regions proposes the union of theory and scientific experience in the search for evolution of the traditional vision and approaches of using ICT resources (based on standardized, closed, autonomous and hierarchical practices) to a holistic perspective, sociotechnical, evolutionary, continuous, relational and interactive.

In this regard, ([17], p. 58) consider “the smart economy an evolution of the conventional urban economy”. Regarding the productive sector, a relevant contribution of the present study is justified by its contribution to the formation of enterprising agents in an intelligent, efficient and innovative urban economy; able to adjust to prevailing conditions and changes in larger economic networks; reinvent itself to deal with internal problems and external shocks; that creates the necessary conditions

Factors that influence training for entrepreneurial activity supported by technological and innovative resources to achieve smart economic growth with friendly policies, partnerships for the development of high-value productive sectors and integration for the various formal and informal sectors.

In view of the above, motivated by such transformations, the following research question emerged: What factors influence the training for entrepreneurial activity supported by technological and innovative resources in Brazil? To answer this question, a survey was carried out with 150 entrepreneurs from the 5 regions (North, Northeast, Midwest, Southeast and South) of Brazil. In this sense, this study aims to understand which factors directly influence the training for entrepreneurial activity supported by technological and innovative resources.

2 THEORETICAL APPROACH OF THE STUDY

2.1 Entrepreneurial Activity (AE)

There is a general understanding that AE is closely related to innovation and the economic prosperity of an environment. [18] has already addressed the issue by envisioning economic development from its association with innovation. For this economist, innovation is what brings the figure of the entrepreneur to the fore, the agent with the ability to introduce appropriate novelties to a target audience, through creative outputs, whether in products, services or a new way of managing a business. business ([19]).

The main contribution of acting or developing an EA, according to some authors, is to provoke a change in the status quo of the company, leading to a search for differentiation in complex markets, contributing to the emergence of challenges that instigate managers to reinvent themselves and create new ones. forms and practices of their organizations, through the available means, and thus extend their longevity in an increasingly competitive market ([20];[21]). Despite its connection with other dimensions and themes, EA has been extensively studied by some authors based on its relationship with innovation ([22];[23]), with strategic positioning ([24]), in expansion of managerial, human and technical skills to face challenges ([25]), and, among others,

From the context presented, it is possible to see that EA is not something static or fixed, but a resource that needs to be renewed continuously. This volatility makes it a fundamental part of the success of business activities ([27]). One of the first authors to study the relationship between entrepreneurial capacity and innovation was Schumpeter, his works emphasized the importance of innovativeness in entrepreneurial processes ([28]). In the 4.0 era, where society is focused on technological development, the Entrepreneurial Education (EE) process has the function of enabling and assisting the entrepreneur in identifying opportunities in an innovative way, thus instigating the innovative potential and developing the dynamics of entrepreneurship linked to the use of ICTs ([29]).

2.2 Entrepreneurship 4.0

Entrepreneurship is a mechanism that moves and develops society, enabling innovation in both products, services and processes, thus emerging new markets and developing greater value generation ([1]). This combination of entrepreneurship and innovation results in new companies based on innovative ideas ([30]). Where the figure of the entrepreneur is configured as a creative person, who imagines, develops and realizes visions, detecting business opportunities through systematic actions and proactive attitudes ([27]; [31]).

Innovative individuals and businesses are imbued with a philosophy where decision-making processes are based on values and behaviors such as innovation, pro-activity, risk-taking, autonomy and competitiveness, which contribute to the creation of new knowledge in order to achieve greater wealth. ([32]). The present author, from the observation of a wide set of studies contextualized here and others, inferred that the combination of entrepreneurship and innovation resulted in new companies based on innovative ideas, and in this sense, it gives rise to a significant space to understand some of the factors that influence directly the formation of this new actor, here called entrepreneur profile 4.0 ([31];[33],[30]).

From the above, it is possible to understand that entrepreneurship is acquiring and producing, over time, a new form and theoretical production as a result of this 4.0 Era or the adoption of innovations and technologies in the delivery of contemporary products and services. However, it is not a new administrative theory to solve all the problems faced by organizations, but rather a form of behavior by managers, which instigates a new knowledge management system and new methods of mobilizing creativity allied to the increase of ICTs ([30];[32];[34]).

2.3 Entrepreneurial Education (EE) for Entrepreneurship 4.0: adoption and use of technological and innovative resources

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3 METHODOLOGICAL PROCEDURES

Regarding the approach to the problem, this article uses data and analysis from a research of a quantitative nature developed with the support of the main author. So that quantitative research predominates an approach that is characterized by the use of quantification, both in the modalities of information collection and in the treatment of them through statistical techniques, presenting its results numerical data, such as errors, reliability and strength of the relations, that is, they are punctual results ([38]).

As for its type, this study is essentially descriptive, with the purpose of describing the factors that directly influence training for entrepreneurship 4.0 in Brazil, not being necessary to explain the phenomena it describes, although it serves as a basis for such an explanation. This type of research seeks to establish relationships between variables and use standardized data collection techniques. Thus, with regard to the data used, an online questionnaire was adopted at the time, applied through the QuestionPro software, from QuestionProInc®, to 150 entrepreneurs from the 5 regions of the country. This procedure took place by sending an access link via social networks (Facebook®, Instagram®, LinkedIn® and WhatsApp®) and emails.

In interpreting the data, we chose to use multivariate analysis, as it is a group of techniques that allows the description of a behavioral profile for a group exposed to the same phenomenon. Among the multivariate possibilities, there is factor analysis, a technique whose main purpose is to define an underlying structure in a data matrix, that is, it allows reducing variables into a smaller set, which seeks to facilitate data interpretation, through exploratory factor analysis.(AFE) ([39]; [40]).

To perform the analysis and interpretation of the main procedures of the AFE, the statistical software SPSS® version 19 was adopted. The steps of the process will be described below.

3.1 Execution of exploratory factor analysis

For the correct use of the statistical technique of AFE, it is necessary to respect some parameters ([41];[42]), such as the Kaiser-Meyer-Olkin (KMO) test, which indicate the degree of fit of the data in the factor analysis, measuring the degree of partial correlation between the variables, so that values close to 1 indicate that the factor analysis method is adequate for data treatment ([43]). Therefore, it is possible to consider that the treatment for the data of this research is acceptable, since the value obtained was 0.886, shown in Figure 1.

Another test performed is the Bartlett's test, which attests to the general significance of the correlation matrix and the hypothesis that it is an identity matrix, with no correlation between the variables. For this, the test value must be statistically significant "Sig." < 0.05, values greater than 0.05 indicate that the data are not suitable for treatment with EFA, which is not the case, as can be seen in Figure 1 ([42]).

Figure 1: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,884
Bartlett's Test of Sphericity	Approx. Chi-Square	1255,276
	df	136
	Sig.	,000

Source: Prepared with support from the lead author (2021)

By looking at the Anti-Image Matrix, which provides the MSA for each of the indicators, and the *communities*, which cannot be presented due to their size, both presented values greater than 0.50 in all cases, which shows a satisfactory degree of relationship and explanation of the variables. So there was no need to remove any variables to adjust the model.

Using the explained variance table, Image 2, it was observed that 60% of the total accumulated variance can be explained by 3 factors. This percentage represents a good explanation, indicating that the variables were well selected from a conceptual point of view. As stated by [41], "Sufficient factors are needed to meet a specified percentage of explained variance, usually 60% or more". For the best grouping of the data, the Varimax rotation method was used, which minimizes the number of variables that each group will have, simplifying the interpretation of the factors, in addition to facilitating the visualization of the relationship between the variables ([43]).

Figure 2: Variance Explained



Source: Prepared with support from the lead author (2021)

After rotating the variables in the SPSS software®, by the Varimax method, a more precise classification of the indicators in each of the 3 factors is allowed, through the Rotated Component Matrix, which presents the final factor structure, Figure 3.

Figure 3: Rotated Component Array

	Component		
	1	2	3
P&D			,600
TECDIS			,592
NIVELAVAN	,653		,431
FLEX			,717
ESTRU	,618		
PERFIL			,653
ANALDADOS	,481		,419
TOMADECI			,607
CAPAC	,635		,403
RBV		,425	
AUTOMAÇÃO	,805		
INOVPROD	,740		
INOVPROCES	,793		
CANALDIVUL		,747	
SATISFAÇÃO		,801	
RETENSAO		,826	
OBTERDADOS		,753	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Source: Prepared with support from the lead author (2021)

Thus, from the Rotated Component Matrix, shown in Figure 3, it is possible to identify the composition of the following factors:

- a) Factor 1: Competitive advantage (41.7%; Figure 2): it is the perception of the added value from learning and adopting technological tools ([44]; [45]; [46]);
- b) Factor 2: Strategy (11.19%; Figure 2): how every organization (organizational actors) learns and uses technological tools for its growth and development ([47]; [48]; [49]);
- c) Factor 3: Entrepreneurial profile (7.25%; Figure 2): it is the change, that education and training, from the intuitive entrepreneur to the analytical entrepreneur, open to the adoption of innovative practices ([49]; [48]; [50]; [46]).

In summary, the results presented indicate that the model of the present study was well explained and presented a satisfactory result as it meets a specified percentage of explained variance of 60.1%, allowing for a deeper analysis of the factors generated by the EFA. Since exploratory analysis consists of being useful to look for a structure in a set of variables or as a method of data reduction ([41]).

3.2 Interpretation of exploratory factor analysis

When we understand entrepreneurship as a catalyst and a major vector of contribution to socio-

economic mobility and to the development of regions ([51]), we also join ([52]) regarding the perception that the Implementation of information and communication technologies (ICT) in entrepreneurship allows the global expansion of sales markets, automation of business processes, transfer of business to online forms, marketing and sales of products and services worldwide, reducing thus its cost through “Scale Effect”, increasing feedback (through greater efficiency), and reducing business risk components (“human factor”).

In the data analyzed in the present study, the factors found that directly influence training for entrepreneurship 4.0 as a new vector of growth and development in Brazilian regions:

- a) Competitive advantage, with an explanatory power of 41.7%, refers to the ability to transform technological resources into technological advantages, that is, the ability to develop technologies and interpret their results. On this fact, [53] focus on the need for companies to invest in lifelong learning, especially with regard to entrepreneurship education that can support creativity and innovation within any organization that aim for a short-term increase in your profits and especially for a long-term sustainability in terms of competitive advantage. Studies have shown that EE has a close connection with the development of a business culture within a society, especially in relation to the emphasis on the value of competitiveness, innovation,
- b) Strategy, with an explanatory power of 11.19%, refers to the ability to convert the company's internal technology into an external competitive advantage and bring results, through the ability to price, advertise and sell, link customers and channels, in addition to market detection and distribution channel. EE and the introduction of ICT practices in the decision-making process are results of the EE process for Entrepreneurship 4.0 and cause an increase in productivity and organizational performance ([49]). The convergence of computing, communication and technological content offers companies opportunities to improve their agility. This agility provides continued success in achieving and redefining value creation and competitive performance through product, service and marketing innovations. The study by ([48]), based on data from 31 countries, showed that entrepreneurs receive higher returns when they start to develop, through EE and innovation and technology resources, an intensely strategic posture.
- c) Entrepreneurial profile, with an explanatory power of 7.25%, refers to the ability to practice management that is open to the adoption of innovative practices, using new forms, methods and resources for the management and organization of the business. This ability is understood to be a fundamental component developed by EE with the support of various resources, innovative and technologically differentiated methodologies ([56]).

4 RESULTS AND FINAL CONSIDERATIONS

Entrepreneurship, when improved by EE and the adoption of innovations and ICTs, becomes, even more, perceived as a dynamic activity that helps in the realization of changes and innovation of processes. And entrepreneurship 4.0 and above all training for entrepreneurship 4.0, is presented as a new vector for growth and development of Brazilian regions. The figure of the entrepreneur 4.0 is seen as one who seeks the best possible arrangement composed of different resources, which may be inside or outside the organization, giving rise to a productive unit with better conditions to negotiate in the market, thus generating new routes and expanding the market.

With the present study, its theoretical survey and research, it was sought to identify the variables that, after the statistical treatment of Exploratory Factor Analysis (AFE) through the SPSS® software, converged on 3 factors: competitive advantage, strategy and profile of the entrepreneur who, based on innovative training supported by ICTs, directly influence training for entrepreneurship 4.0 as a new vector for growth and development in Brazilian regions.

It is noted that the competitive advantage factor showed a high indication, compared to the other two factors found, which shows that it has a strong positive influence in the context of training

for entrepreneurship 4.0. However, three factors are present, have their influence in this new era of entrepreneurship and influence each other contributing to the development of innovation in organizations. Finally, it is possible to say that entrepreneurship is related to innovation, that is, an organization must undertake to innovate. Another yes, depending on the results obtained and based on the discussions presented in the literature on the influential factors in training for entrepreneurship 4.0, it is concluded that the entrepreneurs participating in this research see first what advantage and added value the adoption of training for action Entrepreneurial 4.0 can promote more development and growth of your business. In general, the set of training and practices contribute by instigating the ability to perceive opportunities,

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