TECHNOLOGY ENTREPRENEURSHIP IN ROMANIA - A GREAT OPPORTUNITY FOR THE FUTURE YEARS

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Abstract. *The purpose of this paper is to discover what is the actual level of technological entrepreneurship in Romania, a country that has recently become an important software exporter of the world, despite the fact that the local economic framework is rather average. The paper is structured as follows. First, it explores the literature relating to the term of technology entrepreneurship and explores the issues of IT sector in Romania. The methodological tools were data-mining and case studies, followed by an analysis of the data and discussion of the results. Finally, the paper draws conclusions and makes recommendations for future research, policy and practice. For Romania, technology entrepreneurship is an immense opportunity. IT sector, above all, supports the Romanian economy and is a top employer. The success of this boom has manifold explanations-governmental support, highly qualified, cost-effective human resources. Romania is the third leading country (after India and China) among software exporters. The present study reveals big disparities among regions in Romania, since the large majority of business incubators, business parks or hubs, spin-offs are located only in Bucharest area and in the region of Transylvania. The study reveals that in Romania Business incubators and Technology parks are very successful (such as Liberty Technology Park Cluj or Sema Park in Bucharest). It is difficult, however, to establish the exact financial success of these entities, since their members rarely disclose on their websites what are their profits, turnovers, the number of employees. There are almost no data on spin-offs in Romania. Yet, the disastrous case of UBIT, suggests that universities should be supported by both local community and private companies. Co-working spaces are soaring recently in major cities, hosting young entrepreneurs and start-ups, active in the sectors of technology or creative industries.*

Keywords*: technological entrepreneurship; business incubators; technology parks; spin-offs; co-working spaces.*

Introduction

Scientific inventions and technological innovations can be fructified as new entrepreneurial opportunities. Wireless technology and infrastructure development of information technologies have become vital for entrepreneurship and small business development in the latest two decades. In many developing nations, the so-called called "technological entrepreneurship" is a major way to get a high level of profitability. Romania, for instance, is a country that has recently become an important software exporter of the world. The aim of this paper is to answer the question "What are the key factors that have contributed to the actual level of technological entrepreneurship in Romania?"

The paper explores the literature relating to the term of technology entrepreneurship and explores the issues of IT sector in Romania. The methodological tools were data mining and case studies, followed by an analysis of the data and discussion of the results. Finally, the paper draws conclusions and makes recommendations for future research, policy and practice. The method used for data collection was mainly Internet research of atherogenic items like official statistics, legislation, independent studies, press releases of business incubators and technology parks located in Romania.

Overview of literature on technology entrepreneurship

Dorf and Byers define technological entrepreneurship as „a style of business leadership that involves identification and human resource high-potential capitalization, technology-intensive commercial opportunities, managing accelerated growth and significant risk taking" (Dorf & Byers, 2005). Shane and Venkataraman explain technological entrepreneurship as „the processes of assembling resources, technical systems and strategies by an entrepreneurial venture to pursue opportunities" (Shane & Venkataraman, 2004, p.32). In 2012, Tony Bailetti argues that „what distinguishes technology entrepreneurship from other entrepreneurship types (e.g., social entrepreneurship, small business management, and self-employment) is the collaborative experimentation and production of new products, assets, and their attributes, which are intricately related to advances in scientific and technological knowledge and the firm's asset ownership rights" (Bailetti, 2012).

What are the forms of technology entrepreneurship?

Corporate spin-offs

Spin-offs are divisions of organizations that then become independent businesses with assets, employees, intellectual property, technology, or existing products that are taken from the parent company. The shareholders of the parent company obtain correspondent shares in the new company with the purpose of compensating for the loss of equity in the original stocks. Sometimes, an employee or group of employees leaves an existing entity to form an independent start-up firm. The prior employer can be a firm, a university, or another organization. For example, Fairchild Semiconductor was a spin-out of Shockley Transistor; the founders were Shockley's "traitorous eight", while Intel was, in turn, a spin-out of Fairchild, as many other companies in the semiconductor industry.

Science parks, incubators

Science and technology parks (Research Parks or Techno-parks) encourage economic growth and competitiveness of regions and cities by providing specialized facilities and support services. Usually, S&T parks are associated with universities and support university spin-off companies. The parks offer a number of shared resources, such as incubators, programs and collaboration activities, reception and security, uninterruptible power supply, telecommunications hubs, management offices,

restaurants, shops, bank offices, convention centers, parking lots, internal transportation, entertainment and sports facilities, etc. Science and technology parks are supported either by universities in order to bring in industry with which they can collaborate or by local government in order to improve the prosperity of the community.

Science and Technology parks finance themselves from fees from the rental of space (land, infrastructure, building) and grants, investments, or payments by big companies for R&D contracts, especially if the techno parks associated with universities and/or research institutes (successful S&T parks are at Stanford, Oxford, Cambridge etc).

Business incubators are facilities established to nurture young (start-up) firms during their early months or years. It typically provides access to some form of financing, affordable space, shared offices and services, hands-on management training, marketing support. Corporate incubators are designed for profit-oriented organizations with which to improve a corporation's technology improvement, while university incubators endeavor to leverage technological insights from the university. Business incubators differ from research and technology parks in their dedication to start-up and early-stage companies. Research and technology parks, on the other hand, tend to be large-scale projects that house everything from corporate, government or university labs to very small companies.

The legal framework of technology entrepreneurship in Romania

In Romania, the Business Incubators are financed from both private and public sources. The first Technological Business Incubators were established in the 90's, with financial support from PHARE Programme, The Ministry of Research and managed by the Romanian Centre for Small and Medium Enterprises. Unfortunately, as soon as the support was taken out, most of the incubators vanished.

In 2000, the Romanian Government has launched a program promoting construction of IT-oriented technology parks – special zones that enjoy a favorable tax and customs regime. Industrial parks and cheap labor in Romania have attracted huge companies like Nokia, Emerson, P & G, Kaufland, Roca or Autoli.

Later, the Romanian state issued new laws to encourage the advancement of science and technology parks. According to Law no. 50/2003 on Technology and scientific parks, in Romania, Science and technology parks are an area where developed activities as teaching, research, research are results dissemination, and where these are exploited by economic activities. This was the start of an ambitious project, which was the Multiannual Program of Establishment and Development of Technological and Business Incubators in Romania (2002-2012), coordinated by The Agency of Implementation of Projects and Programs for Small and Medium Enterprises (A.I.P.P.SME's), and implemented by The United Nations Development Program (P.N.U.D.), Romania.

The aim of this Program was that of boosting the small and medium enterprises (SMS's) sector in Romania, by establishing Business Incubators and by improving the efficiency of the existing Business Incubators. Indeed, all companies selected in the

Program received funds for the acquisition of equipment and partial reimbursement of cost with utilities and consultancy services-recruitment process, in elaborating business and marketing plans, feasibility studies, assistance in the process of developing, and commercialization new products on both local and international markets.

In June 2016, the Law no. 102/2016 on business incubators entered into force. According to this act, founders of business incubators are entitled to a series of tax incentives to be granted under aid schemes. Specifically, this involves exemption from land tax, exemption from tax on buildings, exemption from payment of any taxes due for release any urban planning certificates, building permits and / or demolition of buildings for land and buildings related to the business incubator, with the approval of local authorities. The „Business incubator" title is valid for ten years. On request, the period of validity may be extended as long as the incubator still fulfills the conditions imposed by law.

As shown in Law no. 102/2016, among the types of incubators that can be created are: Technology Business Incubator (targeting SMEs with growth potential technology), Academic business incubators (targeting SMEs whose work relates to the implementation / use of results of research and development of a university or research institute), Virtual incubator (offers incubation services via the Internet in the form of business portals) and Incubator for non-agricultural activities in rural areas.

The business environment for technology entrepreneurship in Romania

In 2016, the World Bank has placed Romania 37th out of 189 economies analyzed in terms of ease of doing business. Also useful is to know how it ranks relative to comparator economies and relative to the regional average; in this respect, Romania ranks number four, after Poland, Slovak, and Czech Republics. For a company registered in Romania, opening a new business lasts 8 days. Payment of fees requires 14 payments per year, amounting to 42% of profits and 159 hours required. Sadly, today, Romania is the second lowest economy in the European Union on individual consumption and GDP per capita, after Bulgaria, according to recent data published by Eurostat. A negative aspect of the Romanian economic and social background is the declining demography and youth unemployment, exactly the human factors that could be more involved in developing new technologies. As Dămășaru highlights, "the high values of youth unemployment rate and disparities between urban-rural zones are worrying. A serious concern for the employment of rural youth is more than entitled, because of the inherent difficulties and objectives determined by the low level of qualification and lack of experience, plus reduced offer of jobs for young people in most rural areas. Targeted actions are important for self-employment and to generate trade ideas." (Dămășaru, 2015, pp.27-28).

There is, happily, a big potential for growth. Now, Romania ranks 50 in a ranking of the most prosperous population among 142 countries. This ranking, called the "Prosperity Index" is compiled by the Legatum Institute in London. It is gratifying that Romania's position has improved steadily over the past four years. In "Entrepreneurship and Opportunities" field, Romania rose from 94th in 2012 to 69th in 2015.

Despite such poor economic environment, Romania is one of the fastest-growing information technology markets in Central and Eastern Europe, since in the last decade it has made significant progress in basic telephony, mobile telephony, the Internet and IT. Romania is the leader in Europe, and sixth in the world, in terms of the number of certified IT specialists.

An event that has drawn the attention of the whole world as early as in 2003, was the news that Microsoft acquired the Romania-based antivirus software vendor GeCAD Software. This company was established in 1992 by Radu Georgescu as a Computer Aided Design (CAD) software development company. Its most prominent product, Reliable Antivirus, RAV, was first developed in 1994.

With a maximum speed of 73.6 Mbps internet services in 2015, Internet services in Romania exceed those from many developed countries. In the latest five years, only Bucharest has attracted more than 170 start-ups and means a rapid growth of big software companies and IT services, which is revealed especially by the increasing number of employees.

The presence of global technology corporations such as Intel, Motorola, Microsoft, Oracle, Sun Microsystems, Boeing, Nokia, and others, helped the growth of the IT industry , through software development activities and R&D own centres in Romania. At present, Romania is the third leading country (after India and China) among software exporters and the most important competitive advantage in software development consists of its highly qualified, cost-effective human resources. IT workforce is a driving force of Romania. On average, an entry-level worker receives a salary of 500 Euros per month, whereas a director can win even 6,000 Euros per month. Currently, in Romania, the universities offer annually 3,500 graduates who quickly find jobs both at home and abroad.

14,000 IT companies operate at present in Romania, and, in 2014, they generated cumulative revenues of 4 billion Euros and provide permanent jobs for 75,500 employees and also high incomes for 17,000 freelancers ("PFAs"). In fact, the IT industry is the largest generator of business and jobs in Romania and will probably carry on to be the fastest growing sectors in the years to come.

Brainspotting is the leading technology recruitment and selection consultancy in Romania, working on highly specialized technologies for permanent and interim positions. In a study published in 2014 (Romania IT Talent Map, 2014 Facts & figures), the company reveals that Romanian universities have been Top 3 in the IEEE Design Competition every year since 2001. Romania has more Informatics and Math Olympiad medals than any other European nation and is 3rd globally after Russia (URSS) and China. The number of engineers per capita is greater than in the US, India, China, or Russia; Romania is in top 10 globally in the number of certified IT specialists. Almost 90% of IT professionals speak English.

Most university graduates in IT field are, of course, located in major cities of Romania, and, consequently, the most important hot spots in Romania for IT and BPO services are also located in the same regions. As one can observe, the most developed regions in the computing area are the capital city, Bucharest, and North-West region (historically known as Transylvania). Actually, half of the IT companies are located in Bucharest

and Cluj-Napoca. Other IT hubs are located in Iaşi (Moldova), Braşov and Râmnicu Vâlcea (Central area of Romania), as presented in Table 1.

Table 1. The situation of IT hubs of Romania in 2014

City	Region	Competitive advantage of the city
Bucharest	South-Vest	Concentrates more than half of the IT workforce in Romania. 70% of the top 25 software companies with the highest turnover in Romania have their largest Romanian teams in Bucharest
Cluj-Napoca	North-West	One of the hot spots in Romania for IT and BPO services. In 2012 it ranked 96th in Tholons' top 100 outsourcing sites . The current demand for IT talent surpasses the candidate pool.
Timişoara	North-West	One of the best-developed areas in Romania with social unemployment figures close to the ones before the crisis. Used to be the second IT hub in Romania, before the rapid expansion of Cluj.
Iaşi	North-East	Great IT graduate pool compared to the demands of the market. Less attractive for foreign investors than Cluj, Timişoara, and Bucharest. Candidates are more willing to relocate than those in Cluj, Timişoara, Bucharest.
Râmnicu Vâlcea	Central area	Small IT pool. Many German investments in the region.
Braşov	Central area	Small IT hub, but close enough from Bucharest to be chosen as a secondary place for a company headquartered in Bucharest. Above national average availability of German skills

Adapted after Brainspotting 's study "IT Talent Map of Romania in 2014"

Examples of technology entrepreneurship entities developed in the last decade in Romania

Spin-offs

Presently, there is no official statistics of the spin-offs in Romania. Definitely, the university centres are the ones that provide the most spin-offs, since they concentrate the highest number of researchers, academicians, engineers, and benefit from the best IT, industrial, and communication networks.

One of the most illustrative cases of the spin-off is the one of UBIT SRL, located in Timişoara city, a company that was active between 2003 and 2012. In fact, it is a rather sad case. Several graduates ofthe Polytechnic University of Timisoara have established some start-ups. One of these was UBIT SRL, a limited liability company established in 2003 by a joint venture of Local Council Timisoara, Timiş County Council and the "Politehnica" University of Timisoara, with the support of GTZ (German Society for Technical Co-operation). The partners contributed with 400,000 lei each. The sole domain of activity was the management of the Business Incubator and Technology Transfer in Software field. An important objective was to encourage young people remaining in the city.

The spaces were made available by the University Politehnica Timişoara, that offered beginners in business an ideal working place. For 8 years, the center developed 19 companies, all at the expense of the University, while Timiş County Council has not

paid its obligations. This irregularity was discovered in 2015 by the Court of Auditors. Now UBIT SRL is insolvent, and The County Council has debts of 850,000 lei to Polytechnic University.

Business incubators

Currently, there is no official statistics of the business incubators in Romania. However, the Internet provides a lot of pieces of information about this matter and the own research of the author revealed that now, there are six important business incubators in Romania (the latest being, in fact, a network of 11 local incubators). Most are located in Bucharest and Transylvania, as presented in table 2.

Table 2. Most active business incubators in Romania-2016

Name of business incubator	Location (city)
UBIT Timişoara Software Business Incubator	Timişoara
Technological Business Incubator ITA GOLDTECH ARAD	Arad
Center for Technology Information Fairs and Exhibitions ICPE (CIT-TE ICPE)	Bucharest
CITAf -Technology and Business Incubator Centre	Bucharest
Timişoara Startup Hub	Timişoara
The Incubators and Business Centers Association from Romania (AICAR)	Alba Iulia, Braşov, Mangalia, Sf. Gheorghe, Târgu Mureş, Cluj, Bacău, Satu Mare, Dorohoi, Câmpia Turzii, Timişoara.

Source: Online available data gathering of the author

An interesting case is that of AICAR (The Incubators and Business Centres Association from Romania) that has been established in 2010. The aim of the Association is to strengthen the role of business incubators in the economic development of Romania and the initiative has been supported by the Agency for Implementation of Projects and Programmes for SMEs and the United Nations Development Programme. The members are business incubators from Alba Iulia, Braşov, Mangalia, Sf. Gheorghe, Târgu Mureş, Cluj, Bacău, Satu Mare, Dorohoi, Câmpia Turzii, Timişoara. They are very active in various fields, but, surely, the most important is IT domain.

Other fashionable small business incubators are located in the so-called "Co-working (collaborative) spaces or hubs". They are a new and vibrant type of technological entrepreneurship. Co-working spaces goal is to provide an alternative to traditional offices. This is targeted at entrepreneurs who are just starting out, start-ups and freelancers who either cannot afford to rent space in an office building, or simply want to join the community around these hubs. Bucharest, Cluj, Timişoara, Constanţa, Iaşi, Brasov, Sibiu, Galaţi and Oradea are the nine cities that have developed such hubs that host entrepreneurs and start-ups, active in the sectors of technology or creative industries, as presented in Table 3. Prices for subscriptions of renting an office (which usually include access to events organized within the hub and access to various facilities) are between 40 Euros and 150 Euros per month. There co-working spaces designed in the form of social projects (Hub City Constanţa) members who do not charge rental fees, but some residents instead provides volunteer services to support the operation of hub sites.

Bucharest Impact Hub is the most vibrant entrepreneurship hub of the capital city, located right in the heart of Bucharest, launched in June 2012, by three young investors. It is part of Impact Hub Global Network, an Austrian-based company, with locations in dozens of cities worldwide (only in Europe, there are 46 spots). In 2015, Bucharest Hub Impact had a consolidated turnover of 850,000 Euros. The hub obtained incomes from four major sources: subscriptions of members, renting space for events and related services, software acceleration and incubation (fee sites, sponsorships, financing, depending on the program), collaborations with organizations corporate or nonprofits various special projects.

Table 3. Co-working hubs in Romania-2016

Name of hub	Location (city)
TechHub, Impact Hub Bucharest, Connect Hub, 360HUB, Flash Hub, NOD, MobileHUB	Bucharest, Old city center
ClujHUB, Cluj Cowork	Cluj Napoca
Central Hub	Sibiu
Hub 1317, Hub Onezero,Alchemy Hub	Braşov
StartUP HUB	Timişoara
City HUB, Forte Life	Constanţa
Coworking Oradea	Oradea
Bankers Hubb	Galaţi
The Grape	Iaşi

Source: Online available data gathering of the author

Technology parks

At present, there is no official statistics of the technology parks in Romania. However, by far, the most famous one is Liberty Technology Park Cluj, a private technology park, created to offer exceptional growth and developing for companies in the IT&C and R&D and digital industries in one unique area both conceptually and architecturally, in top office spaces class A in Cluj-Napoca (total surface of 46 880 square meters).

In 2013, Fribourg Development, a subsidiary of the investment fund Fribourg Investments Cyprus, begun the work on technological park Liberty, created by the conversion of a furniture factory in a park for IT companies, an investment amounting to 25 million euro. It offers the first business accelerator in Romania – Spherik, research laboratories, event areas but also relaxation areas (restaurant, coffee shop, fitness gym, playgrounds for children). Transylvania particularly has come to an impressive developing in tech industries, becoming in the last few years a true heart for them. Cluj-Napoca was frequently compared to the Silicon Valley area.

In this technology park, the large majority of firms activate in the IT and telecom industry. Although on the website, companies are not categorized, I tried to make a classification according to their main field of activity. I found out that there are no less than 10 companies with their main field in IT or telecom: Halcyon Mobile, Ecuson Studio, Control Data Systems, GTS Telecom, Luminos Software, Voquz , Supp Office, Altran, Arvato. Other companies activate in very different fields, such as: automotive (Siemens), FMCG (La Casa), financial services (KPM), climate Solutions (Regal Beloit Romania), hubs for business (Impact Hub Cluj-Napoca), logistics (Nordstar Logistik), architecture-design (Omifa), and leisure (Liberty Fitness), services (Spherik

Accelerator, offering 3 months of 1-1 help, workshops, international mentors, networking, product, strategy, marketing, pitching) and Makronetz (other services).

SEMA Park is one of the most representative industrial parks in Bucharest, developed on the former premises of the Semanatoarea factory space, in Grozăveşti area, close to the Polytechnic Institute. Developed in 2008, on an area of land which two decades ago belonged to a significant drill factory, the industrial park Sema Parc offers those who work here all the facilities necessary for organizing and carrying out the activities. The infrastructure owned by Sema Logistics includes: interior access roads with a total length of 2500 m and area of 2 ha, electricity, Internet access, drinking and industrial water, sewerage and gas, dock, bridge cranes, parking lots.

The "Magurele Science Park" project was launched in 2015. Project's initiators were the Ilfov County Council, the Magurele Local Council, the INCDFIN Horia Hulubei, the Magurele High Tech Cluster and the Bucharest-Ilfov Association of Intercommunity Development. The Ilfov County Council and the Magurele City Mayor support the project by participating with the approximately 40 hectares respective land and taxes cut according to the law. The project is an innovative cluster-like open association interested in the exploitation of the businesses potential, of transfer of knowledge and technology which is offered by the Magurele research and academic community and in the perspective the ELI-NP project, under way of being implemented. The fields to be beneficiaries of the future project are very large, including communications, electronics, computers, lasers' engineering, optical engineering, accelerators' engineering, nuke engineering (Romanian National News Agency AGERPRES).

Conclusions

For Romania, developing technology entrepreneurship units is a great chance. IT sector especially supports the Romanian economy and is a top employer. The success of this boom has manifold explanations-governmental support, highly qualified, cost-effective human resources.

In 2000, the Romanian Government has launched a program promoting construction of IT-oriented technology parks – special zones that benefited from a favorable tax and customs regime. Industrial parks and cheap labor in Romania have attracted in the latest 15 years many global companies, such as Intel, Motorola, Microsoft, Oracle, Sun Microsystems, and others, helped the growth of the IT industry , through software development activities and R&D own centres in Romania.

Romania is one of the fastest-growing information technology markets in Central and Eastern Europe. In particular, it is the leader in Europe, and sixth in the world, in terms of the number of certified IT specialists. The country is a champion of Internet speed in Europe and is the third leading country (after India and China) among software exporters.

14,000 IT companies operate at present in Romania, and, in 2014, they generated cumulative revenues of 4 billion Euros and provided permanent jobs for 75,500 employees and also high incomes for 17,000 freelancers (“PFAs”). In fact, the IT

industry is the largest generator of business and jobs in Romania and will probably carry on to be the fastest growing sectors in the years to come.

Unfortunately, the present study reveals big disparities among regions in Romania, since the large majority of business incubators, business parks or hubs, spin-offs are located in Bucharest area and in the region of Transylvania. The rest of the regions, particularly Moldova and Oltenia are very weakly represented in terms of the technology entrepreneurship. This fact has certainly historical explanations since these regions lag behind in many sectors. But for these unfavored areas, exactly the opportunity of exploiting people intelligence is a big opportunity for the future years.

Presently, there are very few official statistics on technology entrepreneurship in Romania. Data mining in this field is a difficult task. However, the Internet offers some press releases of companies or business incubators that can be used by researchers.

The study discloses that in Romania Business incubators and Technology parks are very successful (such as Liberty Technology Park Cluj or Sema Park in Bucharest). It is difficult, however, to establish the exact financial success of these entities, since their members rarely disclose on their websites what are their profits, turnovers, the number of employees.

There are virtually no data on spin-offs in Romania. However, the sad case of UBIT, presented in this study, give a clear signal that universities should be more sustained by both local community and private companies to develop their own research centers, technologies and even companies (spin-offs) that can tremendously contribute to the local development, retaining educated workforce, and, why not, to the prestige of the cities they activate in.

Co-working (collaborative) spaces or hubs are soaring recently in Bucharest, Cluj, Timişoara, Constanţa, Iaşi, Brasov, Sibiu, Galaţi, and Oradea, hosting young entrepreneurs and start-ups, active in the sectors of technology or creative industries. They can be the cradle for future successful companies; we shall be able to check this assumption in the next decade.

A ray of hope for Romanian technological entrepreneurs is the enforcement of the Law no. 102/2016 on business incubators. According to this act, founders of business incubators are entitled to a series of tax incentives to be granted under aid schemes, such as exemption from land tax, tax on buildings, exemption from payment of any taxes due for release any urban planning certificates, building permits.

Recommendations for future research, policy, and practice:
a) The Romanian state should continue to encourage the advancement of the technological Entrepreneurship under the Agenda 2000 of the European Union, exempting from some taxes the technological startups and helping them to develop by establishing an innovative and collaborative framework especially for startups, for SMEs.
b) Local communities, especially those located in desadvantged areas, like Moldova or Oltenia, should contribute with land, fiscal facilities and different types of services offered to those persons and companies that intend to activate in technological parks, business incubators, collaborative hubs. They should also help local universities to

develop, create R&D centers and retain youngsters through innovative jobs in their spin-offs.

c) The author intends to further research what is the financial, human resources, products and markets evolution of the companies that activate in the business incubators and technology parks of Romania, by searching the financial data and other pieces of information that can be obtained from the National Agency of Fiscal Administration and other institutions.

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