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Regional Startup Ecosystem

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Abstract: The article leads to an answer of the research question, whether the developed and implemented regional startup ecosystem model is in line with the elements, principles, objects and iterations of standard knowledge requirements to develop the business environment. In addition the regional ecosystem elements are analyzed in foreign models and the own model is described (the structure, elements, object relations) along with defining its benefits when applying in the real business environment. The article also introduces the conceptual framework of the Czech regional starting of the startup ecosystem and presents examples for entrepreneurs and policy makers. Finally it proposes the dynamisation of the model that can be used as a basis for further research in this area

Keywords: Startups, Regional Startup Ecosystems, Dynamisation of the Regional Ecosystem Model, Conceptual Framework

1. Introduction

An effective method to promote systemically innovations is to create a comprehensive environment for introducing new ideas and innovations. It's about how to link scientific pieces of knowledge and technology so that a successful and sustainable business would be created. Entrepreneurship creates high quality jobs and guarantees the quality of life.

A regional startup ecosystem is an effective method to endorse regional innovations and the development of the business environment along with securing the growth of the domestic product and employment in the given country. This article intends to increase the theoretical and practical knowledge of the key elements and factors that support the growth of the successful regional ecosystem by exploring the model of the regional startup ecosystem in the Czech Republic.

2. Methodology

When determining the scientific hypotheses I will proceed from the complexity and dynamics of the business environment. The complexity is characterized by a large number of components and their relationships in the observed object system. It does not tell us much about the behavior of the system and its response to external stimuli and the like. Dynamic complexity is [12] "a situation in which cause and effect are subtle and where the connection between actions and their effects over time are not completely clear."

As a complex dynamic system a social system can therefore be considered in which new ideas and thoughts arise in the interaction with the environment that transform into real business opportunities and business firms. Their impact and development are dependent on other elements of the startup ecosystem, mutual connections and the external environment. This system can be described and explained in practice on individual cases.

The determination of the hypotheses is based on knowledge of basic pieces of knowledge about the regional startup ecosystem and its analysis of examples of good practice in other countries.

3. Regional Startup Ecosystem and Its Role

The transition of companies to set conditions of the ecosystem is a major paradigm shift, which is well described and implemented only in a few places like Silicon Valley and Israel [7]. At present, our knowledge of the system structures leading to high effects of startup ecosystems in other regions is relatively limited. This begs the question, how the individual elements of the ecosystem understand its implementation, functioning as a whole, the reasons for existence, but also the results. We firstly examine the structural components of a startup ecosystem that is mostly seen to consist of

entrepreneurial startups, different policy agencies, incubators/accelerators, and actors providing risk capital. By applying the competence bloc theory [4] into this context, we show what other economic actors could also be seen forming the startup ecosystem structure. It is rare to have a complete startup ecosystem that has all the needed economic actors locally present [2]

Proper understanding of the ecosystem is based on causality and causes. The startup ecosystem is not only an object, but [10] "but rather as means for 'procedural' building of successful startups. Only the emergence of successful startups as a procedural outcome is at the end a measure of ecosystem's competence and enables the associated positive effects regarding the job creation and economic prosperity."

The results of the work of scientists [9] contribute to research models of ecosystems. They provide the basic structure of business entities involved, social environment, schools and agencies, and define the ecosystem as a shared object of work. I emphasize the importance of studying the complex environment, institutions, incentives, but also economic culture, history, etc.

Breznitz and Taylor [2] maintain that even the presence of all factors of high-tech levels of the entrepreneurial ecosystem will not succeed if the social fragmentation is ob-served. In other words, the local high-tech industry must be locally concentrated on social networks, which allow the growth of the ecosystem. The authors analyze the case of Atlanta cluster technology and argue that the reason for the stagnation was the lack of a coherent social structure.

The description of the system components and their analysis is given in the work of Shane [13]. Only elements and relationships that were explicitly raised in the interviews were added. Continuous arrows denote relationships that were observed all, or almost all, of the times, while dotted arrows denote relationships that were observed only part of the times. The labels in the arrows characterize the type of relationship represented by them.

In the center of Israeli Software Startup Ecosystem Framework, we see the Startup, which is the major entity in which we are interested. It is created by one or more Entrepreneurs, who are highly influenced by the Family, Society, and Culture in which they live, nurturing the entrepreneurial spirit. Culture is shaped by Demographic characteristics, such as national origin, race, religion, gender, language, and influenced by geography, politics, and conflicts with neighboring countries and populations.

Startups develop products based on available Technologies, with a high tendency to use of Open Source software as a foundation [3]. Some startups, mostly the most advanced ones, rely on structured Methodologies such as Agile Methods for software development and Customer Development and Lean Startup for business development. Since Israel's local market is very small, in most cases, it is used only in pilot experiments. Most startups target either a Remote Market (e.g., USA or Europe) or the entire Global Market (e.g., in the case of mobile phone apps or Internet services). Legal framework, including Labor, Tax, and Intellectual Property legislation, as well and patents and the level of bureaucracy required influence the decisions of which market to target and where to host the company.

Product and customer development, as well as marketing and production, require different levels of Funding. This is available both from the public sector, in the form of tax incentives and R&D funding, and the private sector, from Venture Capitalists, Angel Investors, and Financial Markets. Israel counts with one of the best collections of VC funds and angel investors in the globe, making capital available for entrepreneurs.

High-quality Education is a key factor for the success of any innovative environment [14]. According to the 2013 Shanghai Jiao Tong Academic Ranking of World Universities in Computer Science4, Israel hosts four top-50 Computer Science departments. Other institutions such as the Interdisciplinary Center in Herzliya and the Academic College of Tel Aviv also make a contribution. Besides the academic training they receive in the university, entrepreneurs gain practical experience in real projects carried out during their compulsory military service, typically lasting 2 years for women and 3 years for men. Large Established Companies such as IBM, Microsoft, Google, HP, and Intel hold advanced research centers, mostly in Haifa and the Tel Aviv/Herzliya region. They produce and consume high-tech products and ideas cross-fertilizing the startup ecosystem. University and research centers sometimes also create spin-off startup companies around products of their research with the help of their Innovation and Technology Transfer Agencies.

Incubators are programs, lasting for 1 to 2 years, designed to help startup companies in their early stages providing a physical space, supporting administrative staff, as well as mentorship and networking with experts. Israel has about 20 incubators which are private enterprises highly financed by the government. Accelerators consist of short-term programs (typically 4 to 5 months) in which entrepreneurs are immersed on training and mentorship to develop their business model. Currently, there are a handful of accelerator programs ran by the Technion, the Academic College of Tel Aviv, Microsoft, and VCs.

A good example of an ecosystem can be found in Switzerland. Commission for Technology and Innovation (CTI), is the Swiss Federal agency responsible for encouraging and promoting scientific innovation activities. This is achieved by providing financing, consulting services and networks in order to most effectively support the growth of the domestic economy. Support is focused on innovations and market potential, which would remain untapped without the support of CTI. The purpose is to provide a high competitiveness to private entities, especially SMEs, to increase performance and the efficiency so that they would best serve the domestic economic growth and domestic citizens. Innovative projects are supported that meet real demand in the market, and have the potential to achieve economic success, or to bring added value to society. CTI also supports the transfer of knowledge and technology, tries to lead the innovative leaders in the creation of new startups and

works on improving the economic climate for young entrepreneurs.

4. Model of Regional Startup Ecosystem in the Czech Republic

4.1. The Structure of the Model

As mentioned, there are several possibilities of using business support. Small and medium-sized enterprises, however, are usually very limited in getting the standard forms of financing development activities, which include the mentioned bank loans and often are faced with potential partners' suspicion in relation to the degree of development of its business activities, as well as the ability to support its business plan through adequate data and corresponding presentations. The model is also targeted at the development of entrepreneurial activities of SMEs, as well as obtaining practical experience in the commercialization of its own product or service, the practical application of their business plan (through the Development Plan) and the strengthening of marketing and management skills in order to significantly increase the ability of the Applicant to overcome initial difficulties in starting a business and to boost the attractiveness of the business plan of the Applicant for venture capital (especially seed capital). Part of the Consulting is to offer support in the preparation process for obtaining venture capital financing.

4.2. Dynamisation of the Model

The model is focused on the efficient development of activities of small and medium-sized enterprises in their innovative business.

In this particular case, the formation of a system model has been processed in subsequent iterations:

1. formulation of the problem
   - "What is the problem and why is it a problem?"
   - the key variables and concepts that need to be considered,
   - the time horizon (when the program starts, when it ends, how long the support can be used etc.),
   - reference modes - the historical behavior of key variables and their possible behavior in the future,
2. formulation of a dynamic hypothesis
   - "What are the current theories explaining the problematic behavior?"
   - formulation of a dynamic hypothesis explaining the problematic behavior as a result of the internal feedback structure,
   - model boundary chart (system boundary),
   - casual loop diagram a stock and flow diagram,
3. formulation of a simulation model
   - specification of the structure and decision rules,
   - setting parameters, relationships and initial conditions,
   - testing consistency with the purpose and boundaries,
4. proposed strategy and its evaluation
   - specification of scenarios,
   - what external conditions may arise,
   - the new decision rules, strategies and structures of the system,
   - what if analysis,
   - what are the implications of the proposed strategies,
   - sensitivity analysis,

4.3. Description of the Model

The specific tools of systems thinking which were used when examining the problems are casual loop diagrams and stock and flow diagrams.

Causal loop diagrams are used to show the feedback relationships of individual components in the system. Their advantage is that they are easy to understand, which allows sharing the importance of individual relationships. A causal loop diagram consists of variables, which are interconnected with the arrows marked polarity. Polarity is either positive or negative. Positive means that if the action of a cause rises, the overall effect will increase too, if the action of a cause decreases, the overall effect will decline too. The linked variables move in the same direction. With negative marking variables move contradictory.

Stock and flow diagrams are, together with casual loop diagrams, the main starting point for the concept of system-dynamic theory. The purpose of these diagrams is very similar to that of causal loop ones, however, they do not capture only the polarity of the relationships of the variables, but also distinguish the levels and flows.

The level is the accumulation of changes over time mathematically it is represented by the integral, and characterizes the current state of the system. The level is a variable, which accumulates changes over time (step model). It is influenced by flows. This is the status variable, which stores the information. The level characterizes the state of the system at a specific time. Before running the simulation it is necessary to define its initial value, either directly, or by using another variable and link initialization. There are various notations, however, in this research we keep to the notation, where the level is represented by a rectangle.

Further, auxiliary variables are used that are defined by algebraic expressions and graphically represented by a circle. A variable that contains mathematical expressions involving inputs in the form of other variable in the model, are attached to the information link. Prior to running, they are to be defined beforehand, in most situations. They do not have the specified initial value.

The third type is constants, graphically represented by a square rotated 45 °. It is numeric information provided for at the beginning of the simulation. A constant is a variable type, used by other variables. Its value does not change throughout the simulation. As well as all other variables in the model the simulation has to be defined before starting.

For the creation of the conceptual model the notation software Powersim Studio was selected, in which the logic of the dynamics will be subsequently defined. In the following

few paragraphs the notation is briefly described.

Powersim Studio is a tool that allows the modeling of the observed system while keeping the feedback nature inside of the ongoing processes. In addition to the feedback it allows respecting other principles of system dynamics, such as delay, nonlinearity, and the distinction between status and flow variables, and therefore it is the appropriate instrument for the graphical and mathematical representation of the relationships of the components in the systems, where we are dealing with a detailed or dynamic complexity.

The core of the model is the level of the Start-up, which is increased by the flow of the Emergence of start-ups. The emergence of start-ups represents the region's ability to use its monthly potential. To the extent agreed in detail of the model, the potential refers to the number of students of technical universities in the region.

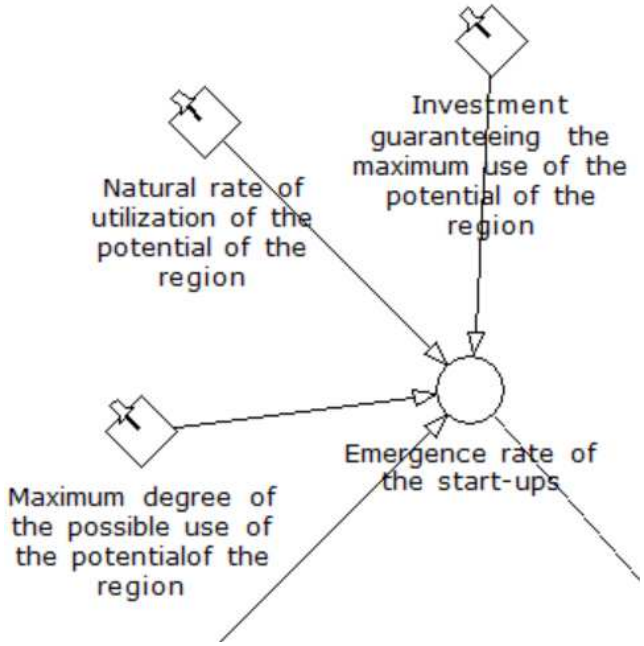

Figure 1. *Emergence rate of the start-ups.*

The ability to use potential is determined by the amount of the investment, which is used to support the business. In the current simplification, it is spread linearly between the Natural rate of utilization of the potential of the region (the formation of start-ups at zero investments) and the Maximum degree of the possible use of the potential of the region (the formation of start-ups in the amount of investments equal to the defined Investment guaranteeing the maximum use of the potential of the region).

The level is reduced by flows of the Outflow of the start-ups from the region, the Failure of start-ups and Growth. The Failure rate of start-ups is calculated as a complement to the Success rate of the start-ups and the Outflow rate of the start-ups. The growth represents a share in the existing start-ups, which are successful, i.e. surviving the first three years of existence.

A business later in the model is recorded as a Successful start-up. The Success rate of the start-ups is dependent on the amount of the investment, which is used to support the business. In the current simplification, it is spread linearly between the Natural rate of success of start-ups (the success of start-ups at zero investments) and a Maximum success rate of start-ups (the success of the start-ups in the amount of the investment equal to the defined Investment guaranteeing the success of the start-up).

Emerging start-ups generate new jobs, as defined by the product of the Number of monthly emerging start-ups and the Number of jobs generated by the starting startup.

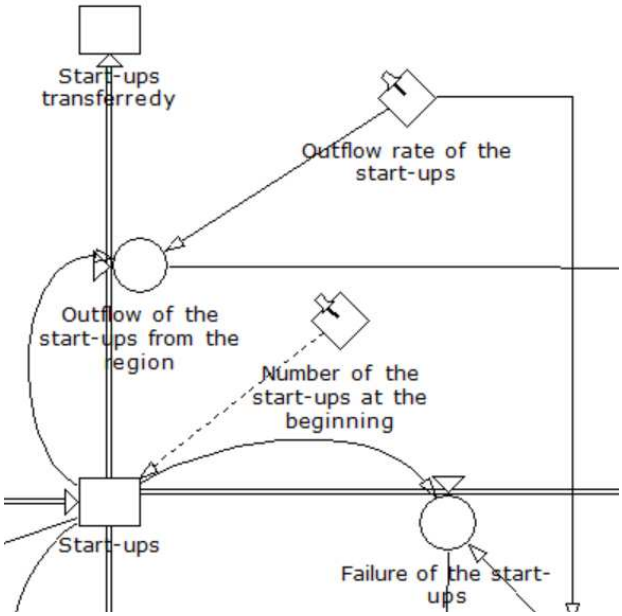

Figure 2. *Outflow of the start-ups from the region.*

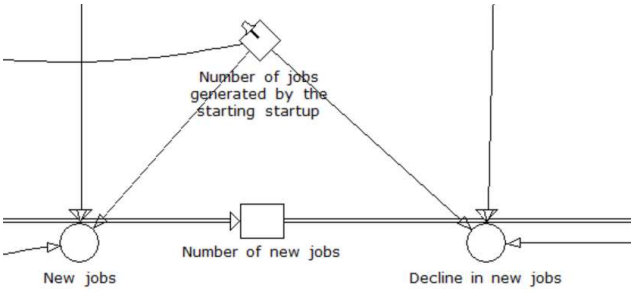

Figure 3. *Emerging start-ups generate new jobs.*

Jobs are diminishing where start-ups fail and outflow from the region. New jobs are generated by successful start-ups, too. The model assumes the increase in the number of jobs by 25% per year. The average age of the start-ups at the level of Successful start-ups is increased with each step of the simulation for 1 month (stride length) and at the same time reduced by weight due to new successful start-ups on the rise that are younger (the model considers the average age of the successful start-up at the entry into the level 3 of years).

The next level is the level of Available resources, which are drawn through the Investment to support the business. This is a field of size 2 (Public x Private finance). Drawing finances is planned for 3 years, then the level is empty and there is no

longer release of additional investments to support the business.

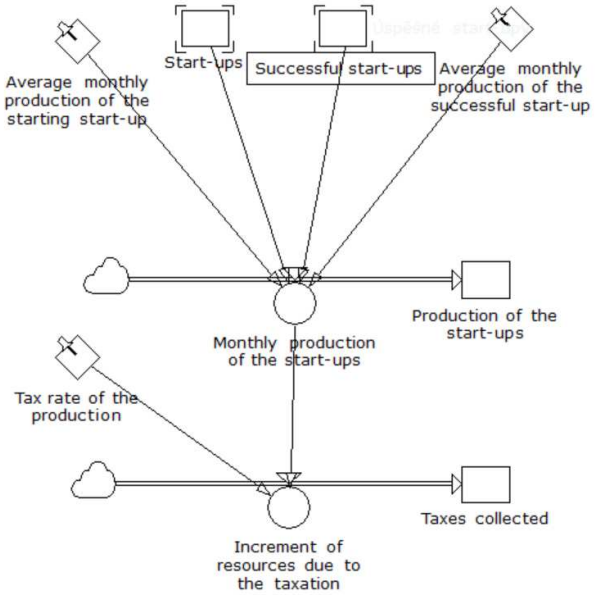

Figure 4. *The level of the production of start-ups.*

The level of the Production of start-ups is implemented by the Monthly production of start-ups, which is defined as the sum of the product of the average monthly production of startups and their current number and the product of the average monthly production of successful start-ups and their current numbers. The Monthly production of start-ups is taxed by the taxation degree and selected taxes are cumulated into the selected tax level with monthly differentiation.

Acknowledgements

In line with the formulated methodology, I can state that the regional startup ecosystem model constructed and described is in line with the elements, principles and objects of the standard requirement for the development of the entrepreneurial environment. This proves especially its dynamic model described in the specification. The weakness of the model remains its excessive focus on the sources of funding and the lack of involvement of private capital.

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