



Business Angels Environment in the Czech Republic and the USA – Case Study

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Abstract

Purpose of the article: Mapping and comparing the investors' environment in the USA and in the Czech Republic. To focus on characteristics of Business Angels in both markets, the Czech Republic and the USA and highlight the main differences.

Methodology/methods: The used research methods are adjusted to the aim of the article. A case study was used as a method of this paper, in order to describe the investors and find out their similarities and dissimilarities. The research was conducted with 50 investors (41 investors from the USA and 9 investors from the CR). In order to provide the triangulation, the author chose three methods of data collection. More specifically, questionnaire, archival data (data on the internet) and interview. The same investors took part in questionnaire as well as in interview.

Scientific aim: The aim of this paper is to map the investors' characteristics in the Czech Republic and in the USA.

Findings: Based on outcomes of used methods, the following facts were found out. Business Angels (BA) in the USA tends to be older, with more experience and higher education than BA in the CR. Investing is considered as their full-time job and based on that fact their portfolio is wider. In the USA, the investors have approximately 8 companies in their portfolio, while in the CR only 2. Source of motivation for the US investors is knowledge transfer to young entrepreneurs (for almost 90% of investors).

Conclusions: In the CR, there is lack of collaboration among BA, which leads to less investments. The solution for improving the situation might be perceived in establishing the syndicates of BA. Moreover, it is necessary to present good quality projects to BA, consequently the young entrepreneurs need more initiatives and opportunities to gain the required knowledge and practice. However, the author suggest that the deeper research with more respondents should be done in order to provide validate data which presents the whole field.

Keywords: Business Angel, Venture Capital, Investing, start-up, seed.

JEL Classification: G24

Introduction

Raising an external financial investment, often described as venture capital, provided by Business Angel (BA) or Venture Capitalist (VC), plays an important role for entrepreneurship. However, for new ventures, the investor is likewise relevant, mainly because of helping to form the ventures' strategic and managerial destiny. The capital structure and extensive financing studies on small- and medium-sized enterprises (SME) throughout the world can be found (Lee *et al.*, 2009). Nevertheless, there is not as much information regarding external financing for start-up businesses. Especially for those which are at the pre-angel stage, also known as seed stage. According to Wong *et al.* (2009), angel investors start providing investment after at least 10.5 months from the birth of the business. In fact, some articles and other publications, often associate the term start-up business with venture capital or angel funding.

1. Venture capital

Investments of venture capital are widely considered as comparatively young form of financial investments. However, there are authors (Dvořák, Procházka, 1998; Metrick, 2007) who claim that some features typical for venture capital can be unearthed in the earliest history of mankind. They indicate that venture capital is as old as the trade itself.

As a first example of venture capital investment, with the identical concept and features¹ of contemporary investments, is recorded way far to 15th century in Europe. Those investments were initial investments of naval expedition and maritime discoveries (Thompson, 2008).

Metrick (2007) states venture capital investments were of great importance during the industrial revolution. It should be mention that investments were in its primitive form, on the other hand they finance advances in technology.

According to Dvořák, Procházka (1998), modern form of venture capital investment consists of three stages. The first stage (1976–1985) is characterized by investments in technology-oriented projects. Present-day giants such as Apple, Google and Yahoo! were established during first stage. The second stage (1986–1990) is featured by expansion of investments, mostly due to high tide of venture capital. A key feature of performed investments was the

need to increase the efficiency and competitiveness in highly competitive market. In the last, third, stage the venture capital can be found in vary shapes, combining various financial instruments in order to meet the financial requirements provided not only by client but also by the investor. A key feature of third stage is the globalization of a market.

In contrast with division made by Dvořák, Procházka (1998), argues Metric (2007) the most important milestone in venture capital market was the year 1979. In 1979 the liberalization of investments rules for American pension funds came into force. Moreover, Metric claims the 60s of the 20th century as a significant milestone due to emergence of a limited partnerships, based on needs of venture capital investments. In the same way, this led to the separation of investors from the management companies responsible for portfolio of enterprises.

Metrick (2007) examines the modern era of venture capital investments. During the period before the boom (1980–1994), the activities and investments grew steadily. However, the economic crisis in the 80s had an impact on them. The second stage is the period of a boom (1995–2000), the investments were doubled compared to the previous stage. Doubling the investment was due to era of the Internet, although some revenues were spectacular. For comparison, the venture capital investments reached about 4 billion USD in 1994 (in USA), while in 2000 the investments were about 102 billion USD.

As the example of investment expansion in this period, 1994, the Amazon.com was established. In its preliminary phase was financed by its founder, Jeff Bezos. In 1995, while reaching its seed phase, was financed by Bezos's family. In late 1995 reached the business angel investment of 54,000 USD and in following 6 months acquired the investment provided by the group of BA in the amount of 937,000 USD. Half year later gained the VC investment in the amount of 8 million USD, while following year, 1997, entered the stock market with the amount of 49.1 million USD (Munck, Saubles, 2006).

The third stage is the period after the boom, after 2000. This period is significantly influenced by crisis and collapse of investment volume when the total amount of investment in 2003 corresponds to the amount in 1997, less than 18 billion USD (Merick, 2007).

2. Venture capital in CR

Activities connected with venture capital grew at the beginning of the 90s of the 20th century. At the be-

¹ Contractual documentation, revenue divided among a proprietor of business plan and an investor (percentage).

gining, the risk investments and assets were taken mostly by investment companies and banks, not by funds of venture capital or private equity (Ptáček, 2014).

The very first fund was established with the financial assistance of the EU and the US, as part of the PHARE program (CVCA, 2010).

CVCA (2013) claims that the first VC fund providing the private sources was created in 1994. In the following years, the international companies entered the Czech market. In following period the Czech Venture Capital Association (CVCA) was established. The CVCA cooperates and is part of European Venture Capital Association (EVCA).

Regarding the fields of interests for potential investment, the Czech Republic is similar to other countries. Nowadays, ICT and new technology are the most often invested companies (Pazour, Marek, 2011).

According to CVCA (2010), the significant change regarding private equity (international) and its free flow happened in 2004 when the CR joined the European Union. The same year, BA became more active due to newly occurred possibilities.

3. Methodology

The aim of this paper is to map and compare the investors' environment. To focus on characteristics of Business Angels in both markets, the Czech Republic and the USA. Furthermore, to note the similarities or dissimilarities between BA in both markets.

The author selected methods which are adjusted to the aims of the paper. To accomplish the aim, a case study is selected as a method of research. According to Hendl (1997), the case study (CS) is the approach of qualitative research and one of the definition is that it is detailed study of a few cases or just a one case. CS are widely used to generate or test a theory as well as ensure a description. CS uses combination of data which may be quantitative or qualitative, or both. Data are collected owing to methods such as experiment, interview, observations, *etc.*

Initial step of each case study is to define a question or an aim of a research. Following phase is to select the collection data method. In order to assure the triangulation, it is essential to apply methods of multiple data collection. Once the data are collected, the data analysis is a sequent phase, while each case is analyzed apart and consequently cross-case analysis is done (Patton, 1990).

Cross-case analysis is a method of a research that simplify the comparison of differences and

similarities of units of case studies analyses (Eckstein, 2002).

Based on the aim of this paper, the research question was created:

“What are the characteristics of Business Angels in the CR in comparison to Business Angels in the USA (in California, CA)? What are the main differences regarding investments and why is it so?”

To provide and assure triangulation, the author selected three methods of data collection:

- Questionnaire.
- Interview.
- Analysis of available documentation regarding venture capital investments in the CR and the USA. Some documentation is provided by the company incubators.

4. Case studies

Fifty Business Angels took part in the research. In the CR, there is a limited number of investors, however the author has decided to establish a basic criteria according to what the BA will be chosen:

- The BA has made at least one successful investment.²
- The BA has Czech/Slovak citizenship for the Czech market and mainly invests within the CR.
- The BA has US citizenship for the USA market and mainly invests within the USA.

The author has decided for the criteria due to following reasons. Criterion one is a sign that BA has made at least one investment and at least one was successful, meaning he or she has some relevant experience. Criterion two is important for gaining the results for the Czech market, whereas criterion three is significant for obtaining results for the US market.

The data were collected in person as well as online. As an initial source of information about investors was used the webpage Angel List (2013).³ Available information provided by angel.co and other sources were analyzed, consequently the questionnaire was sent to individual Business Angels.

Czech or Slovak Business Angels are located in various part of the CR, mostly in Prague or Brno.

² The successful investment is investment into company which does still exist, is constantly growing and generate income for both, investor and owners.

³ Angel List is a US website for startups, angel investors, and job-seekers looking to work at startups. It was founded by Naval Ravikant and Babak Nivi. Angel List offers investment syndicates in which startups raise money from accredited investors investing alongside prominent angel investors (angel.co, 2013).

Based on analysis of available documents, Brno is perceived as “Czech Silicon Valley”⁴ (center of innovation and technology), due to high level of recent investments and increasing number of start-ups. Approached US Business Angels are located in Silicon Valley, due to high concentration of investors and start-ups (Angel List, 2013).⁵

Table 1. Number of participated BAs.

BAs		Contacted		Survey	
USA	CR	USA	CR	USA	CR
672	17	208	15	41	9
		31%	88%	20%	60%

Source: Own calculations.

According to Angel List (2013), in the CR there are 17 BAs who fulfill the criteria established by the author, while in the USA (CA) there are 627 BAs. Although BAs have their profile on Angel List (2013), it is not possible to contact all of them directly.⁶ In the USA it was possible to contact 208 BAs out of 627 BAs, while in the CR the number was 15. The author contacted the BAs who made their contact information (Linkedin, Twitter, e-mail) public (see contacted BAs in Table 1). The percentage of BAs who wanted to take part in the research was 20% in the USA, 60% in the CR.

The questionnaire was sent to investors by email. The questionnaire consisted of the following questions:

1. What is your age?
2. What is your gender?
3. What is your highest education level?
4. What field is your highest education level in?
5. Do you have any working experience before becoming a BA?
6. What is the location of your investments?
7. How much time do you usually spend with BA activities? (Is being a BA your full-time job?)
8. How many companies, in average, do you have in your portfolio?
9. How many percent of projects do you usually accept?

⁴ Mareš, M. (2015). Skypicker prosel Tomkovým investicním trojuhelníkem a dostal 25 milionu, [online]. [cit. 2015-02-14]. Available from: <http://www.forbes.cz/skypicker-prosel-tomkovym-investicnim-trojuhelnikem-a-dostal-25-milionu/>.

⁵ Angel List (2013) Investors in Silicon Valley, [online]. [cit. 2015-02-16]. Available from: <https://angel.co/silicon-valley/investors>.

⁶ Some BAs do not add their direct contact as a result of spam. It is more common in the USA due to high number of start-ups.

Once the questionnaire was returned and processed, the interviews were initiated. The same investors who took part in questionnaire were also interviewed. The interviews were done in person as well as online using Skype, Google Hangout. Also phone calls were made. The questions during the interviews were mostly based on the results of the questionnaires (to gather the additional information and understand the situation).

The following Table 2 provides the comparison of BA in the USA and Europe. In the US there are three times more BA than in Europe.

Table 2. Comparison of BA in the USA and Europe.

Total BAs in 2009	
USA	18 275
Europe	5 309

Source: OECD, 2011.

4.1 US case study

Based on returned questionnaires, data analysis and realized interview, the basic characteristic of US Business Angel can be formulated. The following table provides the absolute frequency and the relative frequency of represented characters.

Table 3. Data from the US.

Q	Answer	A.F.	R.F.
2	Male	39	0.95
	Female	2	0.50
3	Master	41	1.00
	MBA	25	0.61
	PhD	5	0.12
4	Economics	32	0.78
	Technical	9	0.22
5	Yes	41	1.00
6	In the USA	41	1.00
7	Full time	33	0.80
	Not full time	8	0.20
8	5 companies	6	0.15
	6 companies	8	0.20
	7 companies	6	0.15
	8 companies	14	0.34
	9 companies	7	0.17

Source: Own calculations.

In the Table 3, there are the results regarding the US Business Angels presents in absolute frequency (A.F.) and relative frequency (R.F.). In the table there are answers for questions 2 till question 8. According to the research the typical US investor tends to

be older, the youngest is 41 year old, the oldest 60 year old (question 1). Regarding gender, the 95% are male and only 5% female. McKaskill (2009) estimated, based on his research, around 8%. The lowest claimed education is master degree, while 60% have MBA degree and 12% postgraduate degree, mostly in economics or technology. MacKaskill (2009) claims that more than 50% obtain MBA or master, or both. All interviewed investors have previous working experience while 80% of them are investors as a full time job. The author would like to highlight the facts that none of them invests outside of the USA and most of them invest in California, close to their home. To be more specific, according to research made by McKaskill (2009), 23% of BA prefer to invest close to home.

Regarding the last answer for the question 9 (how many companies does BA usually accept) is that BA in the USA usually accepts more than 50% of presented projects (seed and start-ups). However in the table we can see that the BA has an average 8 companies in his/her portfolio. Almost 90% of interviewed investors (35 investors) stated their motivation is knowledge transfer to successfully established companies and to young entrepreneurs as well as the application of experienced gained during their professional careers. Less than 1/3 of investors admit that the motivation is also personal challenge. Only 1/3 of interviewed investors (11 BA) stated that their motivation is based on expectation of higher income.

As a comparison the author would like to mention the findings presented by Benjamin, Margulis (2005). According to Benjamin, Margulis (2005) the typical US investor tends to be older men, from the age of 46 till the age of 65. Most of them have postgraduate degree, often in technical field. All of them have previous management experience, mostly have sold a successful business. The realized investments are between 25,000 USD and 1 million USD per transaction and their minimum income is 100,000 USD per year which is requested by law.

4.2 Czech case study

Based on returned questionnaires, data analysis and realized interview, the basic characteristic of Czech Business Angel can be formulated in the Table 4.

According to research, the typical Czech investor tends to be younger than the US investor. The fact that US investors are generally older support also conclusions of researches made by McKaskill (2009) and Benjamin and Margulis (2005). The youngest Czech investor is 33 year old, while the oldest is 52 year old. Unlike from US market, the

Table 4. Data from the CR.

Q	Answer	A.F.	R.F.
2	Male	9	1.00
3	High school	9	1.00
	Master	7	0.80
	MBA	2	0.20
	PhD	1	0.10
4	Economics	9	1.00
5	Yes	9	1.00
6	In the CR	8	0.90
	Outside	1	0.10
7	Full time	2	0.20
	Not full time	7	0.80
8	2 companies	6	0.70
	3 companies	3	0.30

Source: Own calculations.

typical Czech investor is male. The lowest mention degree is high school degree, 20% of investors have MBA degree and 10% obtained postgraduate degree, in the field of economics. Also 70% of investors have master degree. The typical Czech investor invests within the CR as well as outside of the CR (1 out of 9), unlike US investor who invests only within US. In average the typical Czech investor has 2 companies in his portfolio and 20% of interviewed are full time investors. In average the investors accepts 10% of presented projects (question 9).

During the interview, the investors were asked what is their motivation to be an investor. Less than 40% Czech investors (3 investors) claimed that their motivation is the application of professional experience, personal challenge and knowledge transfer to successfully established companies and to young entrepreneurs. According to research the percentage for US is almost 90%, also McKaskill (2009) argued the percentage is higher than 80%. According to research made by Munck, Suablens (2006) the average percentage for Europe is around 50%. Consequently, the CR tends to have percentage which is close to the average in Europe. More than 2/3 of interviewed Czech investors (7 investors) claimed that their motivation is also based on higher income. The ratio is very close to BA in Europe (Munck, Suablens, 2006).

The answer for the second research question What are the main differences regarding investments and why is it so? can be found in following paragraphs.

The author found the fact regarding percentage of startups which gained investment very interesting, consequently the author asked investors during the interview why is it so. In the CR, 8 out of 9 investors claimed that young entrepreneurs approach them

with an idea, project or start-up which is unfortunately very often sub-standardized and lacking the customers. During the interviews, the author asked more questions related to that topic.

According to investors, the main reasons of poor quality of the submitted projects are following:

- Young entrepreneurs (YE) do not know what customers want and how to approach them (stated 7 investors out of 9).
- YE lack the experience regarding sales and marketing (stated 9 investors out of 9).
- YE have lack of experience regarding financial plan (stated 9 investors out of 9).

As a next reason of unsuccessful investment is perceived the fact that YE do not know how to approach the right investor and how to communicate and cooperate with. Approximately half (4 investors out of 9) of the investors stated that inefficient cooperation and communication might be also the result of their lack of time.

The other finding which the author wanted to find solution for is the number of companies in the portfolio. From the questionnaire it is obvious, that 80% of Czech investors do investing during their spare time due to their full time job which absorbs the most of their time. However, the author asked Czech investors, if there is something what might help them to increase the number of companies in their portfolio, despite quitting their full time job. Entirely 55% of BA (5 investors out of 9) answered that cooperation with another, preferably more experienced BA, would intense their investing activity, and thus increase the number of companies in portfolio.

As a last fact which seems to be remarkable is the division of investors based on their motivation. Whereas almost 90% of BA in the USA are motivated by knowledge transfer to successfully established companies and to young entrepreneurs, in the CR it is less than 40%.

5. Data analysis and discussion

Based on the data analysis of available documents and realized case studies, the generalization and answer on research question can be conducted. However, it is important to highlight that the outcomes from the USA are very limited due to low percentage of respondents.

The main differences among Business Angels in the CR and the USA can be summarized in the following statement:

- BA in the USA tends to be older, consequently with wider experience and capital for investing.

This is also due to fact which is mentioned in the chapter 1 and 2. The first investments in the USA in the form of VC were made during 70s while in the CR it was in 90s.

- BA in the USA are also women.
- BA in the USA have generally higher education than BA in the CR.
- Majority of BA in the USA are full time investors while in the CR it is 20%.
- Source of motivation for almost 90% of BA in the USA is the knowledge transfer to successfully established companies and to young entrepreneur, while in the CR it applies to less than 40% of investors.
- BA in the USA decide to finance approximately 50% of presented projects, whilst in the CR it is only 10%. This difference is explained in the chapter 4.

Regarding the solutions to differences the author suggest following initiative. In order to increase the cooperation among BA, the establishment of syndicate in the CR may be perceived as a solution. By dint of syndicate, the BA may establish a cooperation and invest into projects jointly. The syndicate may also offer the collaboration with more experienced investors. On the other hand, having more than one BA per project may lead to better cooperation with the YE. According to Sherman (2005), having more than one investor per project might lead to considerable success.

In order to improve the cooperation and approach from the side of YE, the author suggests to prepare the case studies or examples in cooperation with BA and YE. Also accelerators and business incubators might find it interesting and may be willing to take part in it. Another solution might be seen in strengthening the cooperation between incubators, YE and BA, in the form of certain job position responsible for mentioned cooperation. Each county in the CR could have one.

As a solution for another challenge regarding poor quality of the submitted projects, the author has been evaluating the university environment and events supporting the YE. Seven out of the world's top 10 universities are located in the USA.⁷ Also the highest amount of start-ups is located in the USA.⁸ The author suggests there might be a correlation

⁷ TES Global Ltd. (2015). Word University Ranking, [online] [cit. 2015-02-18]. Available from: <http://www.timeshighereducation.co.uk/world-university-rankings/2014-15/world-ranking>.

⁸ Angel List (2013). United States, [online] [cit. 2015-02-16]. Available from: <https://angel.co/united-states>.

between the system of university education (and possibilities offered by university) and the number of well-established startups. However, the author proposes this field for further research.

Based on the interviews and analysis of available data sources, the author finds that there is lack of events where students can try to develop an idea or project⁹ and lack of shadowing programs and internships, in the CR.

6. Conclusion

Despite the growing interest in investments into start-ups around the world, in the Czech Republic the realized investments provided by Business Angels are 10 % of presented projects. This appears to be due to substandard projects, which are presented. In addition to that also the lack of cooperation among Business Angels plays a significant role, as well as insufficient cooperation between Business Angel and young entrepreneurs. The author perceives

as a good example of cooperation the investing environment in the USA, more specifically in Silicon Valley.

The author of this paper believes that establishing of syndicates of BA might be helpful as well as strengthening the entrepreneurial background of the YE. As an example might be mentioned e.g. organizing the events where potential entrepreneurs are able to bring their ideas into live, into customers, while receiving the feedback from the professionals.

The author believes that the business angels and entrepreneurship environment in the USA may be an excellent example and may bring several positive effects, e.g. improving the interaction with investors and applicants for the investment, as well as enhance the competitiveness of the proposed projects for investment. However, the author is also aware of the fact that the deeper analysis, than the current article, of the environment and BA has to be taken. More BA have to take part in the research in order to get valid data which might have descriptive value.

Moreover, the author propose that further research regarding improving and strengthening the collaboration with BA and YE should be realized, in order to make this field, in the Czech Republic, sustainable.

⁹ In the CR, there are not such an events like Leanstartup-machine.com, Hackathon, etc. In the CR, there is a niche regarding establishing the universities' official entrepreneurship center – see <http://cet.berkeley.edu/>.

References

- Angel List (2013). *United States*, [online] [cit. 2015-02-16]. Retrieved from: <http://angel.co/united-states>.
- Angel List (2013). *Investors in Silicon Valley*, [online] [cit. 2015-02-16]. Retrieved from: <http://angel.co/silicon-valley/investors>.
- Benjamin, G. A., Margulis, J. B. (2005). *Angel Capital: How to Raise Early-Stage Private Equity Financing*. Wiley Finance, 343 p.
- CVCA (2010). *The Czech Republic 2009*, [online] [cit. 2015-02-16]. Retrieved from: <http://www.cvca.cz>.
- CVCA (2013). *Czech Private Equity & Venture Capital Association 2012 Activity Report*, [online] [cit. 2015-02-16]. Retrieved from: <http://www.cvca.cz/>.
- Dvořák, I., Procházka, P. (1998). *Rizikový a rozvojový kapitál*. Praha: Management Press.
- Eckstein, H. (2002). Case study and theory in political science. In: R. Gomm, M. Hammersley, P. Foster (Eds.), *Case study method: Key issues, key texts*. London: Sage Publications, pp 119–163.
- EVCA (2012). *Central and Eastern Europe Statistics 2012*, [online] [cit. 2015-02-16]. Retrieved from: <http://www.evca.eu>.
- Hendl, J. (1997). *Úvod do kvalitativního výzkumu*. Praha: Karolinum, 243 p.
- Lee, C. F., Lee, K. W., Yeo, G. H. H. (2009). Investor protection and convertibles design. *Journal of Banking & Finance*, 33, pp. 985–995.
- Mareš, M. (2015). *Skypicker prošel Tomkovým investičním trojúhelníkem a dostal 25 milionu*, [online] [cit. 2015-02-14]. Retrieved from: <http://www.forbes.cz/skypicker-prosel-tomkovym-investicnim-trojuhelnikem-a-dostal-25-milionu/>.
- McKaskill, T. (2009). *An introduction to Angel Investing: A guide to investing in early stage entrepreneurial ventures*. Breakthrough Publications.
- McKaskill, T. (2009). *Raising Angel & Venture Capital Finance – An entrepreneur's guide to securing venture finance*. Breakthrough Publications.
- Metrick, A. (2007). *Venture Capital and the Finance of Innovation*. Hoboken NJ: Wiley.
- Munck C., Suablens C. (2006). *Introduction to Business Angels and Business Angel Networks Activities in Europe*. European Business Angel Network.
- OECD (2011). *Financing High-Growth Firms: The role of Angels Investors*, OECD Publishing. *International Journal of Business and Management*.

Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Newsbury Park and London: Sage.

Pazour, M., Marek, D. (2011). *Fondy rizikového kapitálu s účastí soukromých a veřejných finančních prostředků*. Prague: Technology Centre of the Academy of Sciences of the Czech Republic.

Ptáček, O. (2014). Equity Gap on the Venture Capital Market in the Czech Republic. *International Journal of Business and Management*, II(1), pp. 59–75.

Sherman, A. J. (2005). *Raising Capital: Get the Money You need to grow Your Business*. New York: Amacom.

TES Global Ltd. (2015). *World University Ranking*, [online] [cit. 2015-02-18]. Retrieved from: <http://www.timeshighereducation.co.uk/world-university-rankings/2014-15/world-ranking>.

Thompson, R. (2008). *Real Venture Capital: Building International Businesses*. Hampshire: Macmillan.

Wong, A., Bhatia, M., Freeman, Z. (2009). Angel Finance: the other venture capital. *Strategic change*, 18, pp. 221–230.

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