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Segmentation Analysis For Polish Digital Startups in Years 2015 and 2016

Katarzyna Rostek[*], *Agnieszka Skala*[**]

The largest study of the digital industry in Poland has been run since 2015 by the Startup Poland Foundation in cooperation with the researchers from the Warsaw University of Technology. Such studies are not easy to carry out because of the heterogeneity of the definitions of basic concepts, including the definition of a startup. This article presents a comparison of examples of this type of study carried out worldwide and identifies the main differences between them. On the basis of the data obtained from the Foundation's research, a segmentation and comparative analysis of Polish startups was carried out, the results of which are presented in this article. Six main differentiating features of the defined segments were identified, of which the production of hardware by startups and cooperation with academia were of particular interest.

Keywords: startup, segmentation, clustering, SOM Kohonen, characteristics, digital.

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Analiza segmentacyjna polskich startupów cyfrowych w latach 2015–2016

Największe badanie startupów branży cyfrowej w Polsce od 2015 r. wykonuje fundacja Startup Poland we współpracy z naukowcami z Politechniki Warszawskiej. Badania takie nie są łatwe do zrealizowania ze względu na niejednorodność definicji podstawowych pojęć, w tym definicji startupu. W artykule przedstawiono zestawienie przykładowych badań tego typu, wykonywanych na świecie i wskazano główne różnice, jakie między nimi występują. Na podstawie danych otrzymanych w ramach badań fundacji, przeprowadzono analizę segmentacyjną i porównawczą polskich startupów, której wyniki zaprezentowano w artykule. Zidentyfikowano sześć głównych cech różnicujących poszczególne segmenty, wśród których na szczególną uwagę zasługuje fakt produkowania przez startupy hardware'u oraz prowadzenie współpracy z nauką.

Słowa kluczowe: startup, segmentacja, klasteryzacja, sieci Kohonena, charakterystyki, technologie cyfrowe.

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[*] **Katarzyna Rostek**, prof. – Warsaw University of Technology, Faculty of Management.
Correspondence address: Warsaw University of Technology, Faculty of Management, Narbutta St. 85, 02-524 Warsaw; e-mail: katarzyna.rostek@pw.edu.pl.

[**] **Agnieszka Skala**, PhD – Warsaw University of Technology, Faculty of Management.
Correspondence address: Warsaw University of Technology, Faculty of Management, Narbutta St. 85, 02-524 Warsaw; e-mail: agnieszka.skala@pw.edu.pl.

1. Introduction

In many countries around the world is a growing trend towards new innovative businesses and new technology-based companies (named startups) are born each year (Hormiga et al., 2011). Digital startups are new forms of dynamically growing organizations, in which a key element of the business model is based on information technologies. The emergence of startups and ecosystems that they create have generated great hopes for stimulating the fragile and sluggish markets of developed countries (Kelley and Nakosteen, 2005; Olawale and Garwe, 2010, Kubiński and Ropuszyńska-Surma, 2017).

The research on startups is not easy to implement due to the heterogeneity of the definition of basic concepts, including, first of all, the definition of a „startup". Researchers undertaking startup issues in their research and analysis are based on the well-known definition of Steve Blank, according to which a startup is a "temporary organization searching for a repeatable and scalable business model" (Blank, 2005). However, this definition is not a satisfactory methodological tool, especially an identification one, because it refers to subjective and fuzzy concepts. Establishing the method of identifying startups is one of the key tasks for science in this area. This problem is perceived in science publications by researchers around the world (Wasserman, 2008, Blank, 2013, Sullivan, 2016) and in research performed by science and research institutions (Ladd and Kendall, 2017; Jung, 2017; Berger and Köhn, 2017). However, such research is conducted and developed due to the importance of the topic.

J. Santisteban and D. Mauricio (2017) performed world literature research covering the years 2003-2016 in the terms of 4 research questions: 1) What is success for startup?, 2) What factors influence success?, 3) What are the categories and how is success factors categorized?, 4) What are the development stages and what factors influence each stage? As conclusion 21 critical success factors were identified and are classified by the researchers into three categories: organizational, individual and external. The startups go through a series of development stages that are also known as the life cycle. However, in the literature there is no established consensus about that matter. This study considered the following stages: seed, early, growth and expansion. In most cases, however, research on startups refers to specific cases and attempts to generalize them or at least to indicate good practices that can help with: creating an environment conducive to the development of startups, in particular – technology startups (Holstein and Eschenfelder, 2017), rapid development and operational flexibility (Stayton and Mangematin, 2016), adopting modern methods, technics and technologies to strengthen and establishment market position (Moroni et al., 2015; Leea, et al., 2016). The conducted research results in two conclusions, which our article takes account:

1) the topic of startup research is significant and present in research performing in various regions of the world, both in terms of the whole population and individual special cases,
2) research on the local market is particularly valuable and needs, because they taking into account its economic, social, economic and market characteristics and limitations.

The aim of the research is to strengthen the positive impact of startups on the market (Cassar, 2014; Hyytinen, 2015), but also support for potential investors and partners considering the possibility of cooperation (Csaszar et al., 2006, Islam, et al., 2018) and identification of features and conditions shaping attitudes of innovation and creativity (Olugbola, 2017). In order to conduct reliable scientific research (especially quantitative) more quantifiable criteria need to be distinguished that differentiate this population of enterprises, in other words, allowing for a clear distinction between startups and non-startups. As a result of this definitional "freedom", the results of scientific research undertaken so far, remain incomparable, partial and incoherent, which discourages further attempts to scientific exploration of this phenomenon (Obłój, Wójcik and Wierciński, 2017; Kubiński and Ropuszyńska-Surma, 2017, Niklewicz-Pijaczyńska, 2016; Kłobukowski and Pasieczny, 2016, Skalik and Wierzbic, 2013; Antoszkiewicz, 2013). Therefore, we are looking for characteristics that characterize and, more importantly, differentiate startups from the population of all economic entities. At the same time, the situation in Poland is conducive to conduct-

ing research on this market, because of the favorable circumstances:

• the startup environment in Poland is dense, active and known internationally, also it attracts startups from neighboring countries and the region; e.g.: the decision of Google to launch one of only six in the world (three in Europe) spaces for startups: Campus Warsaw; the mature and growing startup environment in Poland is a promising field for in-depth research,

• the establishing of the foundation: Startup Poland has been totally successful and this foundation is a very good example of an institution that can brand and give face to the research, which thus gain the trust of its environment and provide reliable data and a deep insight into the phenomena and research processes; at the same time, obtaining reliable data about startups is the interest of the foundation itself and helps it in achieving its statutory objectives – making market stakeholders aware of the importance and potential of startups in Poland.

Startup research carried out by the Startup Poland foundation since 2015 is pioneering and constitutes a wide research material for a team of scientists specializing in technology entrepreneurship at the Warsaw University of Technology. Co-author of this article is the initiator of this study and started cooperation in this area with the Foundation to give this research the appropriate momentum and quality. She is a scientific supervisor of this research since 2015.

The article presents the results of analyses based on the data collected in the nationwide study of startups operating in the digital sector. The study was carried out for the second time in cooperation with the Startup Poland Foundation and its results were published by the Foundation in the form of a report „Polskie Startupy 2016" [Polish startups[1] 2016]. The study was a continuation and extension of the previous year's analysis, presented during the "3rd International Conference on Entrepreneurship for the XXI Century" (Rostek, Skala 2017). Its main purpose was to observe the direction of changes in the population of startups over two subsequent years – 2015 and 2016. The researchers posed the following key research question, referring to the conducted research in terms of formulating the definition of a startup and working on creating a methodology for identifying startups:

RQ: What are the main characteristics that differentiate and differentiate startups?

In order to answer this question, segmentation research was repeated the following year, aiming to discover the characteristics that best differentiate and identify the subgroups. The main results of both the detailed research and the comparisons between 2015 and 2016 form the main result discussed in this article.

2. Theoretical Framework

Every year, more and more organisations, universities and consulting companies undertake research on startups. Table 1 presents selected publications by consulting firms (PWC, KPMG, Roland Berger) or startup community organisations (Startupfest, Nasscom, German Startup Association) and even a consulting company that itself is a startup (Compass). They have been chosen from among many others using methodological reliability as a criterion, because the main objection to many such studies is precisely their lack of methodological reliability – mainly due to shortcomings regarding sampling procedures and the sample sizes of analysed enterprises. These include, for example, serious inconsistencies in definitions (what is assumed to be a startup) as well as surveying a number and variety of subjects sufficient for obtaining credible results. This is not a simple task, because official statistics or state registers are usually useless for identifying innovative companies, especially new and small (micro) companies.

Global consulting companies usually explore startups mostly from the point of view of the needs of their clients. This primarily involves researching the Venture Capital market and transactions involving VC funds investing in technology projects (KPMG and PWC) and, also, researching startups as potential partners for corporations seeking new sources of innovation (KPMG). It is worth noticing that in these studies startups are almost always examined together with the so-called "ecosystem" that surrounds them or which they create themselves. This applies to the Montreal and Berlin studies, and also to countrywide research: the Netherlands, India, and of course Israel, whose startup ecosys-

Table 1. Selected publications of startup research results worldwide

Title	Year	Author	Scope	Area covered	Description	How is "startup" defined?
Global Startup Ecosystem Ranking	2015	Compass (Startup Genome)	startup ecosystems	Worldwide	Ranking of the world's top 20 startup ecosystems.	small and medium enterprises operating online
MoneyTree Report	2016	PWC	VC transactions	Worldwide	Report on VC investments in technology companies.	A company that has received VC funding and belongs to one of the 20 defined sectors
The startup economy	2013	Google and PWC	startups and the ecosystem	Australia	Identification and research of startups; recommendations for activities supporting the development of the ecosystem.	technology is the core product or service; hyper-scalability (high leverage of revenue from an additional employee), disruptive character of product innovation, revenue below $ 5 million per year.
New Horizons	2015	KPMG	startups and corporations	Netherlands	Study of startups for their potential to collaborate with corporations.	does not define
Venture Pulse	2017	KPMG	VC transactions	Worldwide	VC Market Investing Report.	does not define
Montreal startup ecosystem report	2016	Startup fest	startups	Montreal	Report from a startup research and a startup ecosystem study.	company operating less than 5 years, the core of which is a scalable business model focused on innovation and digital technology.
Think Act. Lessons from the Startup Nation	2016	Roland Berger	startups and ecosystem	Israel	Best practices and data on the startup ecosystem in Israel.	does not define
Tech Start-ups in India	2015	Nasscom	startups and ecosystem	India	Report from a startup research and a startup ecosystem study	business founded since 2010, created or acquired IP rights or creates digital trading platforms.
European Startup Monitor	2015	German Startup Association	startups and ecosystems	Europe	Report from a startup research and a startup ecosystem study.	business under 10 years old; using high tech and/or innovative business models; reports or has the potential for a strong increase in employment and/or sales.

Source: own elaboration.

tem is considered to be the model for those who seek ways to invigorate their own. In the case of Montreal, the research was carried out in cooperation with the municipal authorities, interested in making Montreal an active startup development centre in Canada and throughout the whole of North America.

Startup research undertaken worldwide covers a similar range of issues. The research subjects include business models and customer structure, funding sources, features of founding teams, size and dynamics of employment, innovation, and propensity to export. Most reports include an in-depth analysis of the environment, including frequent in-depth interviews with major local startup scene players as well as development policy recommendations. All of these studies refer to the startup ecosystem as the environment in which startups operate and recognise its quality as a key factor in the development of startups themselves.

Research on startups and startup ecosystems is still fragmented and does not use a unified methodology or, what is important, a consistent definition of the research subject. In cases of greater methodological differences some results are simply incomparable. The common denominator for most startup studies is researching two issues: the first is an attempt to estimate the importance of startups in the economy, in other words, to prove that it is large and growing rapidly. The second question is whether startups create jobs – if so, to what extent and if not, why and what to think about it. Answers to neither of these questions are easy to find in the discussed publications. As for the first issue, the authors believe there is not enough data yet to estimate this contribution, perhaps beyond the largest and most developed mature ecosystems, such as the Silicon Valley or Israel. As for the employment issue, different studies provide opposite definitions. However, if one adopts the definition according to which a startup is characterised by hyper-scalability at the mature stage of its development, which is based on the ability to handle an infinite number of customers (users) with very modest human resources (using appropriate technology such as automated processes), the notion of startups creating jobs stands on a very weak grounds (cf. Skala, 2017).

The research discussed in this article defines a startup as a project that meets at least one of the two following criteria:

1) it belongs to the digital economy sector, which means that information processing or derived technologies make up one or more of the key elements of its business model,
2) it creates new technological solutions in the field of IT / ICT.

This definition has become the basis for the identification of the subjects included in the research population.

3. Research Framework

The "Polish Startups" study is the first in-depth study of startups in the ICT industry in Poland. This research project provides a solution to the research problem, namely the determination of the importance of the digital industry (e-economy or e-business) in the economy of Poland and the region. The starting point was to carry out quantitative and qualitative primary research to characterise this group of companies. The project aims to survey the largest possible, and, ultimately, a representative sample of startups. In addition, Polish startup is defined as an entity operating in Poland or one registered abroad, provided that it has at least one partner who is a Polish citizen and, in a significant part, operates in Poland (e.g. producing software). A branch of a company whose head office is located abroad is not considered to be a Polish startup.

Four editions of the study have been carried out so far: a pilot study and three full editions. Table 2 shows the successive stages of the study.

Table 2. Characteristics of the Polish Startup survey

Research stage	Duration	Number of questions in the questionnaire	Number of respondents	Response rate
Pilot	10.05.–25.05.2015	36	38	53%
Study 1st edition	10.06.–15.09.2015	36	423	17%
Study 2nd edition	04.07.–15.08.2016	37	692	26%
Study 3rd edition	14.06.–30.07.2017	68	764	28%

Source: own elaboration.

The analyses presented in this paper covered data from the first and second editions of the study (2015 and 2016). Table 3 summarises the main characteristics of these studies.

Table 3. Main characteristics of startup studies in 2015 and 2016 – sumary

Variable	2015	2016
Number of startups in the Startup Poland database	2 432	2 677
Total number of respondents	423	692
Number of "qualified" respondents	423	539
Percentage of qualified respondents [%]		
Completed by the CEO / startup founder	80	85
Sells in the B2B model	*57*	*51**
Sells in the B2C model	*28*	*18***
Sells in the SaaS model	39	33
Designs and / or manufactures hardware	*11*	*20*
Creates own software	*49*	*No data*
Sells in e-Commerce model	*22*	*14*
Creates software for mobile technologies	*24*	*14*
Funding from own resources only	*60*	*50*
Uses EU co-financing	23	24
Uses co-financing from VC funds (venture capital)	18	22
Uses co-financing from BA funds (business angel)	20	17
Exports	54	47
Micro-enterprise (employs 1 to 10 staff)	64	59
Does not employ anyone	17	22
Has a woman among the founders	28	26
He has an academic (at least a PhD student) among the founders	15	13
Patents its solutions	*35*	*14*
Works with an academic/science centre	*25*	*42*

* only b2b; ** only b2c;

Answers *marked in italics* are not fully comparable between editions due to the change in the wording of the questions or the form of responses.

Source: own elaboration based on: Skala et al. (2015) and Skala and Kruczkowska (2016).

In 2015, the analysis covered 131 nominal variables of which 127 were used in the analyses, and 416 entities. The results determined the most important subgroups within the population as a whole and the factors that differentiate those subgroups (Rostek and Skala 2017). In 2016, 536 observations were collected. The questionnaire consisted of 144 variables, of which 140 were used for the analysis. Data obtained this way was subjected to segmentation analysis on the basis of differentiating variables but without indicating the target variable of segmentation using three methods:

– cluster analysis – using correlations to construct the cluster matrix to carry out a two-step cluster analysis with learning, making the selection according to the best-variables criterion,
– clustering – using centroids to identify clusters, learning without internal standardisation, limiting the final number of clusters to 4,
– self-organising Kohonen networks – using main components to identify segments, internal standardisation based on range, batch learning and limiting the number of segments to 4.

The results determined the most important subgroups within the population as a whole and the factors that differentiate those subgroups (Rostek and Skala, 2017). The for years 2015 and 2016 were compared.

4. Research Results

Main differentiating factors

For each of the segmentation methods used, the first result of the research consisted of so-called differentiating factors, i.e. the most important variables used for segmentation performed by the given method on the selected data set. As three segmentation methods were used on two sets of data (2015 and 2016), six groups of differentiating factors were distinguished, consisting of 14 unique factors. From this set, nine factors were initially selected, and then reduced to six that were considered to be key for the present study. The frequency of segment differentiation was chosen as the selection criterion, in other words, the chosen characteristics were most often repeated among differentiating variable obtained by different methods, and which, at the same time, characterised the largest number of defined segments. This group includes the following differentiating factors:

– stage of development (mature/early),
– operating in the business to business model: B2B (yes/no)
– hardware production (yes/no)
– conducting export (yes/no);
– main funding source (internal/external);
– cooperation with academia (yes/no).

Cluster analysis

Cluster analysis of data from the 2015 study identified six clusters. Table 4 summarises these results while Table 5 shows the results for 2016 data.

Based on cluster analysis, a typical representative of the startups surveyed in 2015 is a member of the GC1a cluster (150 observations, 36% of the population). It is a small company with about 20 employees, which manufactures its own products and uses a B2B model. Its most common customer is a medium-sized business, and its revenue is stable, although not spectacular.

Table 4. Summary of segmented derived using cluster analysis (2015)

Segment (% of the population)	Key differentiating factors					
	Stage of development	B2B services	Hardware	Export	Funding	Cooperation with academia
GC1a (36)	yes	Yes				
GC2a (8)		Yes				
GC3a (18)				yes	own	
GC4a (3)			no			
GC5a (7)			yes	yes		yes
GC6a (12)				yes		

Source: own material

Table 5. Summary of segments derived using cluster analysis (2016)

Segment (% of the population)	Key differentiating factors					
	Stage of development	B2B services	Hardware	Export	Funding	Cooperation with academia
GC1b (12)				yes		
GC2b (43)	mature			yes		
GC3b (8)					external	
GC4b (5)			yes			
GC5b (13)			no	yes		no
GC6b (9)				yes		yes
GC7b (6)						

Source: own material

The most interesting and seemingly developmentally strongest among the identified segments is the GC5a cluster. Representatives of this group primarily produce hardware, and describe their products are globally new. They export, and generate largest revenues from sales to Germany. They also maintain a regular co-operation with a university or a research centre.

A typical representative the startup population surveyed in 2016 is a member of the GC2b cluster (199 observations and 43% of the population). It is a group characterised by a highly dynamic development, which sells its products abroad. The entities are located primarily in Poland, but have branches abroad. However, they are not looking for foreign sources of finance. They also prefer to employ their staff on a permanent basis.

It is worth emphasising that the cluster analysis did not distinguish any groups that would be particularly unique. Comparing the results to those obtained by other methods, one can even risk stating that this method does not work well for the segmentation of the startup data in this study.

Clustering

Clustering carried out in 2015 led to a four-segment solution, and the same number of segments was derived from the 2016 data. The results are presented in Tables 6 and 7.

Table 6. Summary of segments derived on the basis of clustering (2015)

Segment (% of the population)	Key differentiating factors					
	Stage of development	B2B services	Hardware	Export	Funding	Cooperation with science
SG1a (34)		Yes	no		own	
SG2a (22)	**mature**	**No**	**no**		**external**	**yes**
SG3a (17)	**mature**	**Yes**			**external**	
SG4a (27)	early	No			own	

Source: own material.

Table 7. Summary of segments derived on the basis of clustering (2016)

Segment (% of the population)	Key differentiating factors					
	Stage of development	B2B services	Hardware	Export	Funding	Cooperation with academia
SG1b (20)		yes	no		own	no
SG2b (24)	**early**	**yes**	**yes**		**external**	**yes**
SG3b (27)	**mature**	**yes**			**external**	**no**
SG4b (29)	early				own	

Source: own elaboration.

The clustering solution looks different than the cluster analysis result – the tables are filled more "densely", so the key differentiating factors more often apply to individual segments, which makes it much easier to describe these segments and understand their specificities. Four of the identified segments (marked bold in the tables) are particularly interesting and distinctive: SG2a, SG3a, SG2b and SG3b.

Entities belonging to segments SG2a or SG3a are at the mature stage of development, often employ people with scientific titles, cooperate with scientific centres, and a person with a scientific title is often found among their founders. Development is financed by an external investor and innovations they implement ma are product related. In most cases operations are profitable, but the time it took for regular revenue to appear varies from one year to even several years. There are also differences between SG2a and SG3a. SG2a startups are focused on individual customers while SG3a primarily serve businesses. SG3a declare that their products are globally new, while SG2a offer globally new products as often as locally new ones. SG2a firms are most commonly involved in software development, while SG3a startups produce both hardware and software. SG3a are much more likely than SG2a to use the SaaS model, and they also provide analytics, research, marketing or Big Data services. In summary, it should be noted that the characteristics of SG2a companies describe a leading operator on a consumer market, while those of SG3a describe a leading entity serving business customers.

Analysis of the data for 2016 shows that SG3b is the segment that is the most developed and advanced in terms of growth. This is the only group in this classification that has achieved positive revenue growth (ultimately not included among key differentiating factors). The subjects in this group do not cooperate with the academia and their products are targeted at the corporate client – especially micro and small companies. Entities from the SG2b segment collaborate with scientists, universities or research centres, and a third of subjects in this group declare having their own laboratory. It was also the only group in the 2016 sample which employed people with a PhD or a higher degree. As a result, the products of this segment are, much more often than in other segments, related to the electronics industry, key enabling technologies (KETs), the Internet of Things (IoT), and Life Sciences.

SOM Kohonen's network

As was the case for the clustering method, SOM Kohonen's network segmentation resulted in a four-segment solution in both study years: 2015 and 2016. The results are presented in Tables 8 and 9.

Table 8. Summary of segments derived using SOM Kohonen network (2015)

Segment (% of the population)	Key differentiating factors					
	Stage of development	B2B services	Hardware	Export	Funding	Cooperation with academia
Som1a (21)	**Mature**	**yes**	**yes**		**external**	**yes**
Som2a (25)	Early	no				
Som3a (29)	Early	yes	no			
Som4a (25)		yes		no		no

Source: own elaboration.

Table 9. Summary of segments derived using SOM Kohonen network (2016)

Segment (% of the population)	Key differentiating factors					
	Stage of development	B2B services	Hardware	Export	Funding	Cooperation with academia
Som1b (33)		yes		yes		no
Som2b (16)			**yes**	**yes**	**external**	**yes**
Som3b (30)					own	no
Som4b (21)					own	

Source: own elaboration.

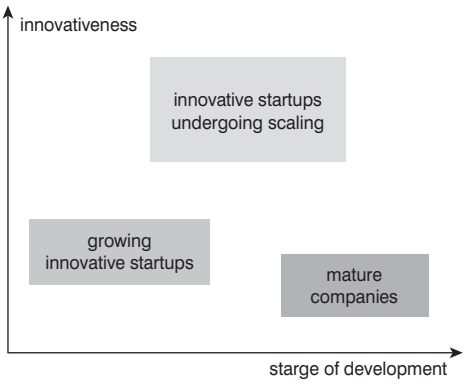
Within the 2015 data analysis, the SOM1a segment is distinctive. This group uses the B2B model and offers services in the SaaS formula. Its main products are hardware and software. It intensively cooperates with universities and research and development centres. It owns patents and registered trademarks.

In the 2016 solution, two segments of exporters are noticeable: SOM1b and SOM2b, with the latter having likely a much higher growth potential. Both segments achieve the highest levels of revenue and SOM1b is the leader in terms of revenue growth rate. Both segments are also characterised by the fact that their founder is a person with business experience. SOM2b mainly serves small businesses, is involved in the design and manufacture of hardware, and works with scientists.

5. Analysing results of 2015 and 2016

The results of the 2015 study indicated the existence of three startup clusters: 1) growing innovative startups, 2) scaling innovative startups, and 3) mature companies (Figure 1). The main differentiating factors of the population were identified (Rostek and Skala, 2017).

Figure 1. Illustration of segments isolated in the population of Polish startups



Source: Rostek and Skala (2017).

The re-analysis of the 2015 data set and the inclusion of data from the study carried out in 2016 allowed for the extension of the conclusions, albeit with care due to not always comparable data.

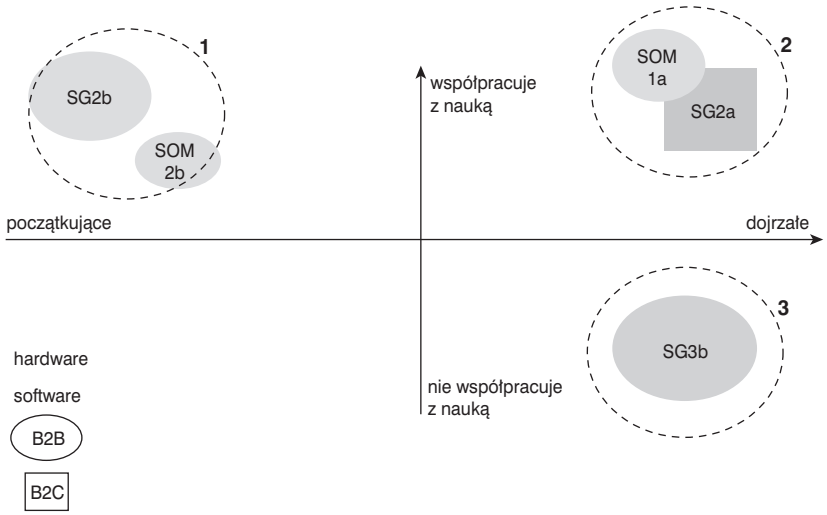
Firstly, two main factors that differentiate segments in both editions of the study were identified:
– products and services directed at business (B2B) or consumer (B2C) customers,
– external or own sources funding.

There are also four further important differentiating factors:
– maintaining cooperation with academia,
– focusing on the production of software or hardware,
– stage of company development,
– export.

On the basis of these differentiating factors, distinctive segments (clusters) of startups were identified, that is clusters which receive the highest number of indications on the most important differentiating factors:
1) SG2a (22% of the population in 2015): mature B2C startups producing software, collaborating with academia and benefiting from external funding;
2) SG3a (17% of the population in 2015): mature B2B startups financed by external investors;
3) SOM1a (21% of the population in 2015): mature B2B startups producing hardware, with external funding, collaborating with academia;
4) SG2b (24% of the population in 2016): early/growing B2B startups that produce hardware, collaborating with academia, using external financing;
5) SG3b (27% of the population in 2016): mature B2B startups with external financing, not cooperating with academia;
6) SOM2b (16% of the population in 2016): early/growing hardware startups, exporters, with external financing, cooperating with academia.

All of these segments are backed by external financing, which can be seen as evidence of their high market potential as verified by investors. In Figure 2, five of the six distinct segments are mapped (segment SG3a was omitted due to the lack of distinct values for the differentiating characteristics of cooperation with academia and hardware production variables) and three meta-segments are proposed based on the main characteristics differentiating the study population.

Figure 2. Segments and meta-segments of startups based on segmentation analysis



Source: own elaboration.

Figure 2 presents the three distinct meta-segments in the population of the surveyed startups:

1) a homogeneous meta-segment of early/developing startups producing hardware for business customers, cooperating with the academic sector (2016);
2) heterogeneous meta-segment of mature startups cooperating with academia, producing hardware for business customers or software for consumer markets (2015);
3) homogeneous meta-segment of mature B2B startups not cooperating with academia (2016).

Conclusion

The two-year history of research so far does not allow for formulating strong conclusions about trends and dynamics of changes occurring in the startup market in Poland. Nevertheless, each edition of the study brings the goal of determining the significance of these entities for the Polish economy closer. The high, and growing, number of surveyed entities and the fact that in more than 80% of the cases the questionnaire was completed by the company presidents allows for a high degree of confidence in the results obtained, despite the fact that the sample was not statistically representative. It can be summarized that the Polish startup ecosystem is clearly maturing and becoming more professional. The advantage of business solutions is growing, including, in particular, the case of larger, whatever you say, more stable and solvent companies. Grown up, in terms of life and professionalism, startuppers can afford the longer self-funding of their business, the more so as they are sooner and sooner able to get their first revenues. Entering the stage of scaling-up the business makes it necessary to reach for external financing that clearly tends to be deferred in time. Investor funds first of all enable the employment of new specialists, availability of which becomes an increasing challenge for founders. This favours the importation of foreign staff, which in turn stimulates the positive trend of growing (though still low) cultural diversity and openness to countries abroad. And export is the most effective springboard for startup development, which our survey has confirmed for the third time in a row (Beauchamp, Kowalczyk and Skala, 2017).

The segmentation analysis based on 2015 and 2016 data presented in the paper points to several general conclusions that can be formulated:

– among the early/growing startups, companies producing hardware for busi-

nesses are of particular interest for investors and show high dynamics of development;
- mature startups often cease to cooperate with academia, which can potentially affect their innovation and, consequently, competitiveness, especially on foreign markets;
- most of the startup segments engage in export to a greater or lesser degree, so this variable does little to differentiate the derived segments;
- as high proportion of surveyed entities were involved in B2B production, external financing and exports (Table 3), it is not surprising that these variables are among the most strongly differentiating factors. However, with much lower frequencies for the other two key differentiating features, i.e. hardware production and collaboration with academia, their relevance for startups will likely increase in the near future much faster than for other variables;
- in the light of the fact that all the segments identified in the analysis used external financing, it can be argued that the availability of this source of funding in Poland is at least sufficient.

The second-last of these applications answers the research question raised in the introduction to the article. The research program presented in this article will continue in the coming years, which suggests that future results, derived from a growing body of collected data, will allow for an increasingly in-depth analysis and will become more and more valuable for the management of this type of enterprises and projects.

Endnotes

[1] The reports from the years 2015 and 2016 can be downloaded from www.startuppoland.org/knowledge

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