26th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems (KES 2022)

The Impact of the Covid-19 Pandemic on Start-ups' Collaboration with Corporations

Michał Bańka[a1,] Maria Kukurba[b,] Aneta Waszkiewicz[c]

[a]Faculty of Mechanical and Industrial Engineering, Warsaw University of Technology, ul. Narbutta 85, 00-662 Warsaw, Poland;
[b]Faculty of Mechanical and Industrial Engineering, Warsaw University of Technology, ul. Narbutta 85, 00-662 Warsaw, Poland;
[c]Department of International Finance, SGH Warsaw School of Economics, al. Niepodległości 162, 02-554 Warsaw, Poland

Abstract

One of the options for corporations to gain a competitive advantage in the marketplace is by establishing business cooperation between large companies and start-ups. Start-ups see corporations as recipients of their solutions (products, services). Meanwhile corporations are interested to a large extent in getting access to breakthrough technologies, innovations, new business models present on the market. This paper deals with the assessment of opportunities for business cooperation in the start-up-corporate model at the background of global market turbulence caused by the Covid-19 pandemic. The research focused on the perception of this cooperation from the perspective of start-ups', which: are at different phases of development (concept phase, development phase, scaling up phase) and are characterised by different lengths of time they operate in the marketplace. This paper aims at presenting the impact of market turbulence on the relationship between start-ups and corporations, and thus to verify the research question regarding the impact of market perturbations caused by the COVID-19 pandemic on mounting corporate interest in cooperation with start-ups. The results were analysed based on a sample of 101 start-ups participating in acceleration programmes with the involvement of large companies, organised by start-up accelerators.

The findings allow to draw several conclusions: representatives of start-ups more often observe a decrease in interest and priority of cooperation between corporations and start-ups in connection with the emergence of a global pandemic. Moreover, they less often feel that corporations are looking for start-ups outside their core areas of interest, while it is start-ups that have to adapt to the changing needs of technology users.

[1] * Corresponding author - Michał Bańka, Tel.: +48 602-462-230.
  E-mail address: michal.banka@pw.edu.pl

Keywords: start-up, start-up accelerators, corporations, Covid-19

1. Introduction and theoretical aspect

1.1. Introduction

The world's first accelerator, Y Combinator, was established in 2005 in Cambridge Massachusetts by Paul Graham [1]. Since then, accelerators have begun to be widely used around the world by corporations, universities, governments and investors as a highly effective approach to business generation [2]. Start-up Genome[2]in its 2021 Report highlights that start-ups will be crucial to the post-COVID economic recovery as they create the majority of net new jobs in the economy and most importantly provide innovative digital technologies [3]. The same Report highlights five sub-sectors that were in the growth phase between 2015 and 2022 i.e. 1) Agtech & New Food, 2) Blockchain, 3) Advanced Manufacturing & Robotics, 4) AI & Big Data, 5) Fintech. Start-up accelerators, especially those classified as corporate accelerators and those accelerators working in collaboration with and for large enterprises are a desirable partner to support start-ups in setting up business partnerships with corporations. For start-ups, acceleration programmes offer support in product development, expert knowledge and the opportunity to get in touch with large players in the market. For corporations, on the other hand, acceleration programmes offer an option of fast access to new technologies, innovative solutions, business models affecting the expansion of the corporation's offer with new products, or enhancing profitability and cost efficiency. However, how dynamically this cooperation will develop is determined not only by the readiness of start-ups, but also by aspects affecting the climate of such relationships driven by the market situation. Therefore, the authors decided to verify the following research question: how the Covid-19 pandemic affected the cooperation between start-ups and corporations. The above research focused on three aspects: a) start-up development phase, b) the moment of establishing cooperation and c) the length of the start-up operation in the marketplace.

This paper is structured as follows: presentation of theoretical operational aspects of acceleration programmes. Next, the research methodology and analysis findings are presented. Finally, conclusions and directions for future research are presented.

1.2. Theoretical aspect

There is no consensus on a universal definition describing accelerators [2]. Based on research [1,2,4,5] and [7], the accelerator concept can be defined as a fixed-term, iterative, learning-oriented programme designed to support new business ventures in the early phases of their life cycle by providing mentoring, education, sometimes financial support, networking opportunities and getting access to potential investors and large companies to help them rapidly develop and scale up their business ideas [6,8]. The accelerator programmes run by accelerators are characterised by a **fixed lifetime** (usually 3 to 6 months) [1,2,4]. Setting short deadlines and strict end dates for programmes creates an environment incentivizing rapid progress [1,6] as it accelerates development cycles of new ventures and forces them to quickly test and verify ideas [2,7,9]. It also enhances market efficiency and maximises programme profit by reducing the amount of support a start-up requires from an accelerator [6]. Commercially available programmes are characterized by intensive educational and mentoring content. [10] Programmes include frequent contact between start-ups and mentors, entrepreneurial training and networking opportunities with potential beneficiaries of their

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[2]Start-up Genome is the world-leading research and policy advisory organization for public and private agencies committed to accelerating the success of their start-up ecosystem.

solutions [11]. Although the mentoring may have different forms it is a cornerstone of every accelerator [4,12]. The programme itself often ends with a so-called demo day, where start-ups present their business to investors (e.g. venture capital funds, business angels) and technology recipients (e.g. corporations). In addition to networking opportunities, most accelerators offer companies an opportunity to interact with graduates of the programme [9] and, in an increasing number of cases, direct access to corporations interested in the start-up's solutions. As shown by the theoretical analysis, the important characteristics that influence the setting up of business ties between start-ups and corporations within accelerator programmes are as follows: 1) the start-up development phase (concept, growth, scaling up), 2) the phase of start-up establishing cooperation, and 3) the length of time the start-up has operated in the marketplace. This study was carried out with consideration given to the above drivers of research question posed.

2. Research methods and sample

The survey was conducted using the CAWI (Computer-Assisted Web Interview) technique on a sample comprising 101 start-ups covered by accelerator programmes with corporations. The sample included those start-ups that participated in an accelerator programme run by an accelerator. The start-ups surveyed represented the industries of technology (53 start-ups, 52.5%), internet platforms and services (11 start-ups, 10.9%) and hardware technology/construction (8 start-ups, 7.9%), insurance (5 start-ups) and financial services (5 start-ups). The remaining 19 start-ups (18.8%) represented other industries. Start-ups were at different development phases - the largest share of start-ups were in the development phase (49 cases, 48.5%), 32 start-ups were in the concept phase / MVP phase (31.7%) and 20 were in the scaling up phase (19.8%). Start-ups that had been on the market for two to three years were the most frequently cited in the survey (30 start-ups, 29.7%). 26 start-ups operated on the market between three and five years (25.7%) and 22 between one and two years (21.8%). Start-ups operating 6 to 12 months (10 start-ups, 9.9%), less than 6 months (9 start-ups, 8.9%) and more than 5 years (4 start-ups) were recorded less frequently. Due to the fact that the survey dealt with start-ups' capability to establish business ties with corporations, it was also checked with which entities / institutions the surveyed start-ups cooperate. The predominant answer was cooperation with corporations (large enterprises). This type of cooperation was indicated by as many as 87 surveyed start-ups (86.1%). 72 companies also launched cooperation with medium-sized enterprises (71.3%), while only 31 with micro/small businesses (30.7%).

3. Data collection

The following steps were taken in the data collection step:
1. Development of closed questions. The questions asked to assess the impact of market turbulence on cooperation in the start-up-corporate model.
2. Establishing contact with selected start-up accelerators that actively run accelerator programmes with corporate participation.
3. Building a database of start-ups that have participated in acceleration programmes with corporations.
4. To determine in consultation with accelerators and start-ups the CAWI survey as the most suitable technique for the research process was adopted.
5. Implementation of the survey consisting in the generation of individual links for start-ups included in the database and their distribution via e-mail to accelerators for further dissemination. By generating individual links to the survey by the research team, the authors were able to control the number of completed forms, and in the event of their absence, they asked the accelerators again for completion of responses by start-ups. The results obtained were coded and stored on the server. Their quality and completeness was constantly monitored through the use of PS Questio software based on SPSS Data Collection.

The collected data were collected on the server and categorised according to the research sample received. Before generating the results, the data completeness was checked. The data was then exported to IBM SPSS Statistics 25 data analysis software. Frequency analysis, descriptive statistics analyses including the Kolmogorov-

Smirnov test, a series of univariate analyses of variance in an between-group design and Spearman's ρ rank correlation analyses were performed. The classical threshold of α = 0.05 was considered as the level of significance. Probability results of test statistics at $0.05 < p < 0.1$ were interpreted as significant at the level of statistical trend.

4. Survey findings

4.1. Basic descriptive statistics for quantitative variables measured

In the first step, basic descriptive statistics of the quantitative variables under study were calculated along with Kolmogorov-Smirnov tests to check the normality of the distributions of the quantitative variables under study. As can be seen in Table 1 for all variables a distribution close to normal distribution was recorded. In such a situation it is advisable to verify the value of skewness of distribution of the mentioned variables. If this value falls into +/- 2 bracket it should be assumed that the distribution of the studied variable is not significantly asymmetric with reference to the mean value (George and Mallery, 2019). Such a value was recorded for all the variables studied. Therefore, it was decided that statistical analyses would be performed using parametric tests.

Table 1. Basic descriptive statistics for quantitative variables under study

	M	Me	SD	Sk.	Kurt.	Min.	Max.	W	p
Enhanced interest in cooperation among technology users	4.66	5.	2.36	0.44	-0.26	1.	10.	.19	<.001
Reducing the priority of cooperation with start-ups	6.26	6.	2.33	-0.18	-0.73	1.	10.	.16	<.001
To stimulate the interest of companies in start-ups that have not previously been of interest to them	5.09	5.	2.25	0.37	0.05	1.	10.	.22	<.001
Increase the ability of start-ups to adapt their activities to the changing needs of the technology user	6.98	7.	2.11	-0.05	-1.13	2.	10.	.16	<.001

M - mean; Me - median; SD - standard deviation; Sk. - skewness; Kurt. - Kurtosis; Min and Max - lowest and highest values of the distribution; W - Kolmogorov-Smirnov test result; p - significance

4.2. Assessing the impact of a pandemic on start-up-corporate collaboration

It was then decided to verify the main research question of this paper. A series of frequency analyses was performed and the results are presented in histograms. First, the evaluation of the statement 'greater interest in cooperation of technology users' was taken into account. As shown in Fig. 1, responses were recorded on the entire scale used - from 1 (strongly disagree) to 10 points (strongly agree). The average value was 4.66 points (SD = 2.36), which is slightly below the theoretical value indicating the average intensity of the studied variable. Both the median and the dominant are 5, probably in the opinion of the respondents pinpointing a value indicating no opinion on the matter. It should be noted, however, that when it is assumed that scores between 1 and 4 indicate a reduced or low level of agreement with the statement, and scores between 7 and 10 indicate an increased or high level of agreement with the statement, the prevalence of those answering negatively to those answering affirmatively is as high as 43.6% to 20.8%. So while overall start-up representatives show a whole cross-section of attitudes towards the statement that technology buyers are more interested in collaboration, there is a preponderance of voices disagreeing with this statement.
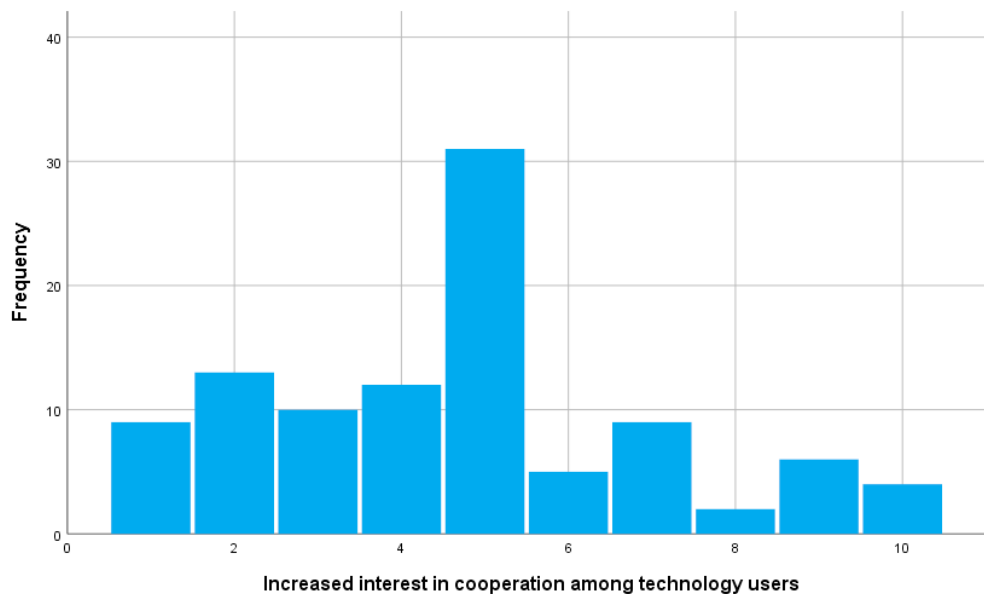
Fig. 1. Distribution of results for the statement 'greater interest in collaboration by technology recipients.

The statement 'reducing the priority of cooperation with start-ups' was then taken into account. As can be seen in Fig. 2 in this case the proportion of responses reversed. Once again, the category was clearly dominated by answers indicating no opinion to this extent (5 points), however, there is a clear predominance of results indicating high agreement with the statement given - results between 7 and 10 points were obtained by 45.5% of the surveyed sample, while results between 1 and 4 points were obtained by only 18.8%. Thus, the majority of start-up representatives not only did not observe an increase in interest in cooperation from technology users, but actually felt a decrease in the priority of such cooperation. The average score in the sample was 6.26 points (SD = 2.33) with a median of 6 points.
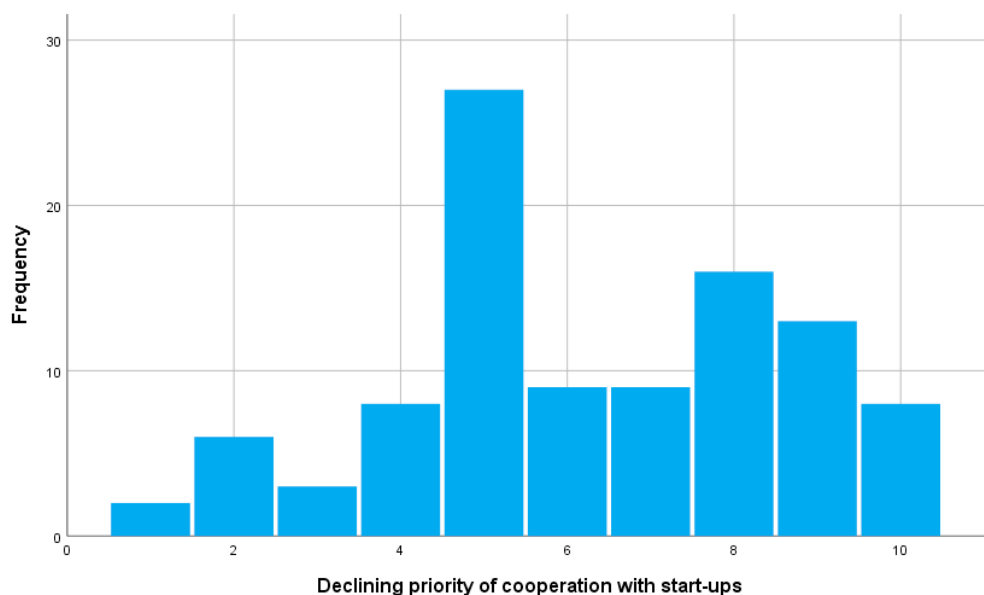

Fig. 2. Distribution of results for the statement 'reducing the priority of working with start-ups'.

Next, the distribution of answers for the statement 'awakening of interest of companies in start-ups, which previously did not lie in the sphere of their interest' was analysed. As Fig. 3 illustrates, a significant part of respondents had no opinion on this. The average score was exactly 5.09 points (SD = 2.25) with a median and dominant score of 5 points. There was a slight predominance of results indicating a low level of agreement with the statement compared to high scores - 31.7% to 22.8%. However, this is smaller than for the previous two statements examined.
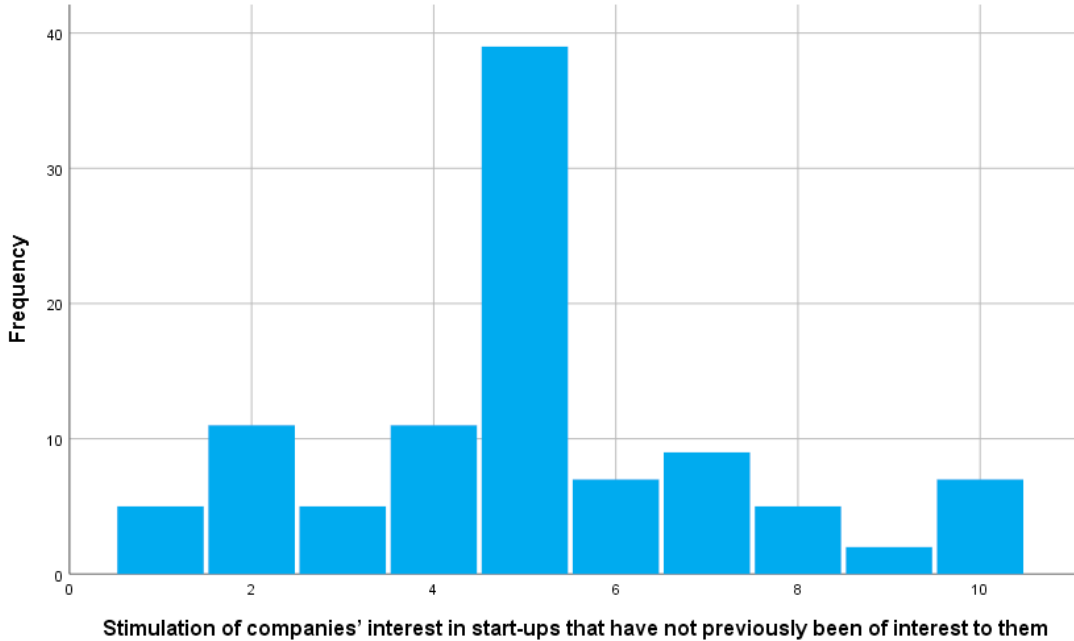

Fig. 3. Distribution of results for the statement 'Awakening companies' interest in start-ups that were not previously of interest to them'.

The results for the statement 'increase the ability of start-ups to adapt their activities to the changing needs of the technology user' was the only one without an extreme answer (no respondent marked an answer with 1 point) and where there was a clear advantage of high scores over low scores - 54.5% vs. 9.9%. Still the dominant value was 5 points, while the mean value was clearly higher - 6.98 points (SD = 2.11) and the median was even slightly higher at 7 points. This was therefore the only case where the median value in the sample indicated an increased level of agreement with the statement presented.

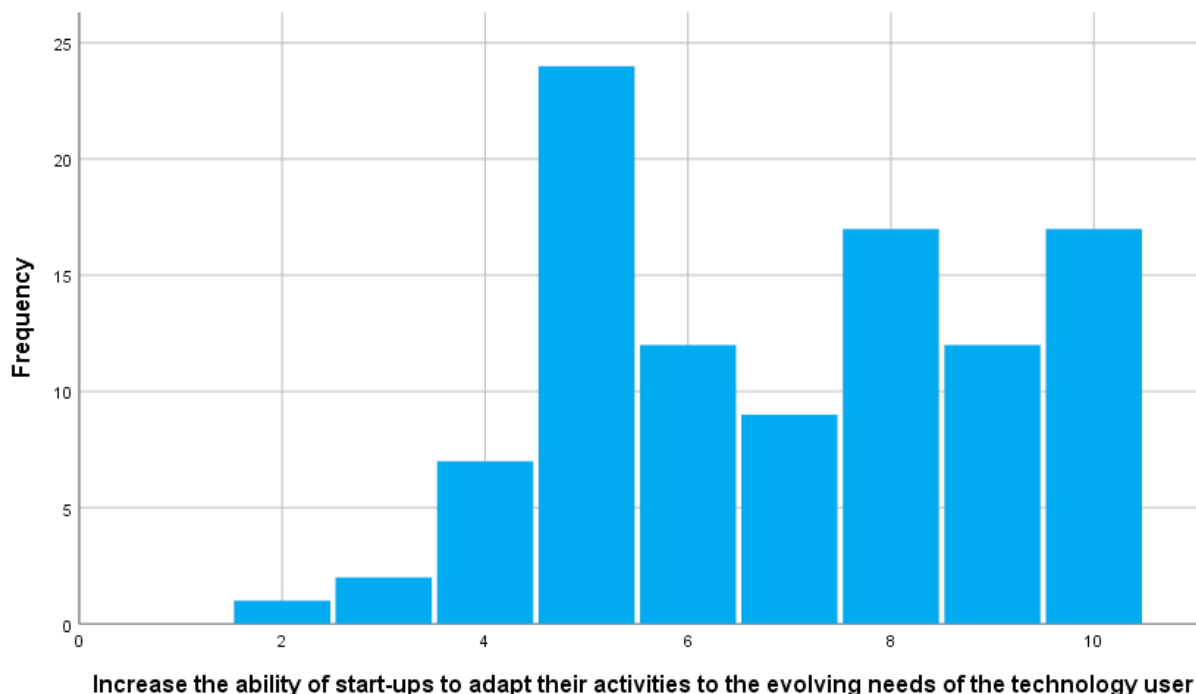**Increase the ability of start-ups to adapt their activities to the evolving needs of the technology user**

Fig. 4. Distribution of results for the statement 'increase the ability of start-ups to adapt their activities to the changing needs of the technology user

4.3. Assessing the impact of the pandemic on start-up-corporate collaboration and the current stage of start-up development

In order to verify whether the current stage of start-up development is related to the assessment of the impact of market turbulence including pandemics on co-operation between start-up and corporation, a series of univariate analyses of variance was performed. As can be seen in Table 2, there was only one result at the level of statistical tendency - for the statement of greater interest in cooperation by corporations. This result prevented analysis using a post-hoc test, nevertheless it should be noted that the lower agreement with this statement of start-ups in the development phase. There is a certain diversity of results - the lowest level of compliance with the presented statement was observed in the category of start-ups in the scaling-up phase - however, it cannot be stated with sufficient certainty whether this result would be confirmed in subsequent samples. It would be advisable to repeat the analysis on a larger sample of start-ups, especially in the scaling-up phase. In the case of the three remaining statements, no ANOVA test result was recorded even at the level of statistical trend, so the level of agreement with these statements was at a similar level in the three subcategories studied.

Table 2. Assessment of the pandemic impact on start-up-corporate collaboration and the current stage of start-up development

	Concept / MVP (n = 32)		Development (n = 49)		Scaling-up (n = 20)				
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	η^2
Increased interest in cooperation among technology users	5.06	2.64	4.10	2.01	5.40	2.46	2.93	.058	0.06
Declining priority of cooperation with start-ups	6.00	2.30	6.16	2.48	6.90	1.97	1.00	.373	0.02
Stimulation of companies' interest in start-ups that have not previously been of interest to them	5.06	2.46	4.94	2.07	5.50	2.37	0.44	.644	0.01
Increase the ability of start-ups to adapt their activities to the changing needs of the technology user	7.25	2.44	6.82	1.86	6.95	2.21	0.41	.667	0.01

4.4. Assessing the impact of a pandemic on start-up-corporate collaboration and the stage at which a start-up enters into collaboration with a corporation

In the next step, a series of univariate analyses of variance were performed to verify whether the stage of a start-up entering into cooperation with a corporation is related to the assessment of the impact of market turbulence on start-up-corporation cooperation. As can be seen in Table 3, no results were recorded even at the level of statistical trend. Thus, the assessment of the impact of the pandemic on start-up-corporation cooperation was not significantly related to the stage at which the start-up entered into cooperation with the corporation.

Table 3. Assessment of the pandemic impact on start-up-corporate collaboration and the phase of a start-up entering the collaboration with a corporation

	Concept / MVP (n = 55)		Development (n = 36)		Scaling-up (n = 10)				
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	η^2
Increased interest in cooperation among technology users	4.75	2.46	4.47	2.42	4.90	1.60	0.20	.820	0.00
Declining priority of cooperation with start-ups	6.09	2.33	6.47	2.52	6.40	1.65	0.31	.735	0.01
Stimulation of the companies' interest in start-ups that have not previously been of interest to them	5.13	2.37	4.97	2.27	5.30	1.49	0.10	.905	0.00
Increase the ability of start-ups to adapt their activities to the changing needs of the technology user	7.15	2.21	6.94	2.06	6.20	1.69	0.85	.429	0.02

4.5. *Assessment of the pandemic impact on start-up-corporate collaboration and the length of time a start-up has been on the market*

In a final step, it was tested whether the assessment of the impact of the pandemic on start-up-corporate collaboration was related to the length of the start-up's existence in the market. A series of Spearman's ρ rank correlation analyses were performed. As can be seen in Table 4, none of the relationships tested turned out to be even close to statistical significance. Thus, it should be assumed that the assessment of the impact of the pandemic on the start-up-corporation cooperation is not significantly related to the length of the start-up's operation on the market.

Table 4. Assessment of the pandemic impact on start-up-corporate collaboration and the length of a start-up's life in the market.

		length of time the start-up has been on the market
Increased interest in cooperation among technology users	Spearman's rcc	-.120
	Significance	.231
Declining priority of cooperation with start-ups	Spearman's rcc	.129
	Significance	.199
Stimulation of the companies' interest in start-ups that have not previously been of interest to them	Spearman's rcc	.041
	Significance	.685
Increase the ability of start-ups to adapt their activities to the changing needs of the technology user	Spearman's rcc	-.053
	Significance	.597

5. Discussion and conclusions

The research findings indicate some general trends in the attitudes of start-up representatives towards the challenges posed by market turbulence - such as the COVID-19 pandemic - poses to their business. First of all, it should be noted that expressed opinions vary significantly. Within the scope of all questions examining the issue of start-up-corporation cooperation in the context of a pandemic, there were answers agreeing with the statements provided, disagreeing with them, and having no clearly formed opinions on the topic under study. The high percentage of responses indicating no opinion may suggest that at least some start-ups have not felt the impact of the pandemic on their own operations at all. Nevertheless, the survey findings show a general picture - start-up representatives are more likely to observe a decline in interest and priority in corporation-start-ups co-operation, less likely to feel that corporations are looking for start-ups outside their core areas of interest, and it is start-ups that have to adapt to the evolving needs of the technology user. Certainly the opposite is also true, probably due to the way of doing business or specific relations between particular start-ups and corporations, so one should be cautious in formulating strongly generalised conclusions. Start-ups, as entities with a high degree of diversity both in terms of their organisation and scope of operations, are characterised by a very high variability in their ability to adapt to specific conditions of their activity. Interestingly enough, none of the selected factors included in this study, i.e. the start-up development phase, the phase of cooperation launch and the length of the start-up operation on the market, were significantly associated with the opinions of the representatives of these start-ups regarding the impact of the pandemic on the cooperation in the start-up-corporate model. Although it would seem natural that companies with a longer track record and a higher development phase will perform better in disadvantageous circumstances, however, the study findings did not confirm such assumptions. It is likely that the high diversity of results in subcategories marked by different stages of development of a start-up and the moment of starting cooperation with a corporation

are primarily related to the specificity of the business. The obtained results indicate the necessity to verify the opinions of start-up representatives primarily in the context of the type of conducted activity and the specificity of existing before the turbulent interaction between the start-up and the corporation. It also seems very interesting to analyse this issue from the perspective of corporations' representatives involved in cooperation with start-ups. It would also be highly valuable to carry out a longitudinal study on the same entities to verify changes in both the opinion of their representatives and more objective indicators of the quality of start-ups, for example in the form of changes in profits generated.

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