In-depth Literature Review

Michał Bańka*, Mariusz Salwin*, Aneta Ewa Waszkiewicz, Szymon Rychlik, Maria Kukurba

Startup Accelerators

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Abstract: Accelerators have been becoming increasingly popular among young entrepreneurs interested in developing products, attracting investors, or establishing relations with industry represented by large companies.

The focus of the studies is to conduct literature review due to the small number of scientific articles are available on this topic. The article aims to show the current state of knowledge about startup accelerators and the support they provide. It outlines what added value accelerators offer in their programs for young innovative companies.

To achieve the stated aim, the authors combine a systematic literature review with a bibliometric analysis. The results of this research will be helpful in better matching the developed project with existing accelerator programs on the market. It can contribute to a better understanding of the principles governing the programs, program expectations of the accelerator and its partners with respect to the proposed solutions (corporations, business angels, and venture capital funds).

Keywords: accelerator, bibliometric analysis, literature review, startup, startup accelerator
JEL Classification: G24, G32, G23, L20, L26

1 Introduction

The changes taking place in the world economy point to a transformation toward knowledge-based economies relying on highly processed and technologically advanced products [Salwin and Kraslawski, 2020; Salwin et al., 2020; Salwin, 2021]. This process determines the competitiveness of enterprises, including startups [Drover et al., 2017]. Global competition, rapid and dynamic technological change, increasing digitalization, and the ever-shorter product and service life cycles have all changed the traditional corporate mindset [Barbero et al., 2012; Wright and Drori, 2018]. The increasingly apparent need for continuous growth is forcing large companies and corporations to look for alternative ways to keep growing or to maintain their position as market leaders in a given sector [Kukurba et al., 2021]. Great emphasis is placed on environmentally friendly solutions, Industry 4.0, or sustainable development [Lipiak and Salwin, 2019, 2021]. There is an erosion of the previous corporate operating model, where three types of business activities could be distinguished: (a) activities focused on maintaining customer relationships (prospecting, acquiring, and building relationships); (b) activities related to the creation of product or service innovations (new, attractive products with added value); and (c) activities related to infrastructure and its development, ensuring the construction and maintenance of a functioning infrastructure, including

***Corresponding authors: Michał Bańka and Mariusz Salwin,** Faculty of Mechanical and Industrial Engineering, Warsaw University of Technology, Warsaw, Poland. E-mail: michal.banka@pw.edu.pl; mariusz.salwin@onet.pl
Aneta Ewa Waszkiewicz, Collegium of World Economy, SGH Warsaw School of Economics, Warsaw, Poland.
Szymon Rychlik and Maria Kukurba, Faculty of Mechanical and Industrial Engineering, Warsaw University of Technology, Warsaw, Poland.

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platforms necessary to provide products or services in the market [Osterwalder et al., 2010; Casanova et al., 2017; Wright and Drori, 2018; Bodner et al., 2021]. Access to innovation, knowledge, and technology is becoming a key factor in gaining competitive advantage and maintaining a favorable market position [Aghion et al., 2009; Casanova et al., 2017]. Competitiveness and innovation are becoming common requirements for large organizations that want to grow and ultimately survive in the marketplace. We can now see the emergence of countless new business models [Osterwalder and Pigneur, 2002; Osterwalder et al., 2010]. Old and declining industries are being replaced by new ones based largely on digital technologies, very often provided by young and innovative startups [Aernoudt, 2004; Kohler, 2016]. Further market innovations are transforming existing industries and established business models on an unprecedented scale and at an extraordinary pace. The need for companies to adapt to the growing needs of individual and institutional customers requires them to generate and implement more innovations [Salwin et al., 2020; Laspia et al., 2021]. Many of these innovations are created in startups – young companies looking for a business model that offers the opportunity to create added value for their audience [D'Eredita et al., 2011; Carmel and Káganer, 2014]. The goal of such companies is to scale business to a company that brings a breakthrough product to market. Large companies are looking for advantages on the market, for example, by organizing their own startup acceleration programs or establishing cooperation with business accelerators operating on the market. Thus, accelerators become key intermediaries in the creation and distribution of innovations coming from outside. Startups make up the vast majority of businesses operating in the market, but they have much weaker financial positions than more mature businesses, which are the recipients of innovation and technology [Enkel and Sagmeister, 2020; Caccamo and Beckman, 2021]. These companies are constantly facing many difficulties in financing their products, services, or growth. Participation in an accelerator program enables startups to establish more effective cooperation with business, especially since there can be a mutual misunderstanding due to the different ways in which startups and large companies operate. By creating the space to reduce or eliminate such misunderstandings, accelerators form the link between large companies and startups. Accelerators provide multifaceted support and mediate between startups and corporations, connecting them to each other. In so doing, they contribute to the emergence and commercialization of new solutions in the market and the acquisition of customers or funding for further development [Carvalho et al., 2017; Guijarro-García et al., 2019; Gutmann, 2019; Crișan et al., 2021; Gür, 2021].

The issue of startups and accelerators is becoming increasingly popular every year. However, there is a lack of systematized studies on the current state of knowledge on this topic, which has been raised by many authors in their articles [Carvalho et al., 2017; Guijarro-García et al., 2019; Gutmann, 2019; Crișan et al., 2021; Gür, 2021]. In reviewing the literature, Carvalho et al. [2017] focus on organizing the knowledge regarding the types of accelerators and entrepreneurship support. Gutmann [2019], in his research, sorts out the literature on different forms of Corporate Venturing (CV) with a focus on accelerators, incubators, and venture capital. Guijarro-García et al. [2019] addressed the current knowledge on startup accelerators, trends, and gaps in this area based on a bibliometric analysis of 21 articles. Other authors focus on aspects related to the functioning of technology transfer in corporate accelerators [Gür, 2021] and zoom in on the activities of startup accelerators and their role in supporting entrepreneurship and innovation [Crișan et al., 2021].

This article centers on the combination of a systematic literature review and a bibliometric analysis to shed new light on the research area of startup accelerators. The conducted analysis is characterized by a novel approach to the publications on the examined topic, which have been indexed in the Scopus database so far. The article meets the expectations of many researchers [Pauwels et al., 2016; Casanova et al., 2017] and systematizes knowledge in the area of startup accelerators. It is one of very few studies in this area to date [Wright and Drori, 2018].

The article is structured as follows. The first part is the Introduction. The second part presents the research methodology. The third section presents a review of literature on startup accelerators. The next part is the bibliometric analysis. The last part of the paper contains conclusions.

2 Materials and methods

The aim of the article is to present the current state of knowledge about startup accelerators. The following research question was posed: what information about startup accelerators is available in the literature?

To achieve this goal, a combination of two research methodologies was used: systematic literature review and bibliometric analysis. This combination helps to get a broad picture of the research being carried out and to assess its quality. The following steps were taken under the two methods:

1. Systematic literature review – at this stage, the authors focused on the analysis of knowledge concerning startup accelerators. The Scopus database was selected for the study, where publications in the years 2011–2021 containing the term "startup accelerator" and its synonyms were searched in titles, abstracts, and keywords. Based on the assumptions made, 81 publications were obtained and carefully analyzed. This led to the rejection of five publications significantly deviating from the analyzed topic. The result of this stage was, therefore, 76 publications on startup accelerators, which were further investigated.
2. Bibliometric analysis – in this step, 76 articles were studied. This was to identify the authors, sources, research institutions, and countries with the highest productivity and, at the same time, popularity in the area of startup accelerators. For the purpose of this study, the total number of papers (TP), the total number of citations (TC), and the average citations per paper (TC/TP) were analyzed. In the next step, an indicator-based analysis was carried out using i_j – the impact factor of the analyzed research topic calculated for the j-th source, Pearson's correlation, and c_p^Y – the weighted coefficient of the number of citations per year in the p-th publication.

3 Systematic literature review

One of the early works on university accelerators is a report on the operations and expansion plans of an interuniversity startup accelerator in Syracuse in northern New York State. The report presents the results of a program aimed at reducing the outflow of young people from the region by activating their entrepreneurship both during and after their studies, thus leading to the economic development of the region. The report discusses the principles associated with the project, such as motivating innovation among not only university researchers but also students; opening up to and integrating students from all disciplines and universities; strengthening university–business partnerships; using coaching as a tool to build programs and attract talent; and seeing opportunities in local needs. The program assumes that the greater the number of startups, the better is the prospect, as it only takes a few victories to generate a high return and attract new investors. The program also aims to teach its participants to accept failures and to treat them as lessons. The experience gathered and the lessons learned were to become a source of knowledge for other universities and communities as to the advantages, disadvantages, adaptability, and scalability of the acceleration model [D'Eredita et al., 2011].

A similar topic, related to the methodology of running a startup, was addressed in a 2013 article [Järvi et al., 2013]. In this piece, the authors combined an already proven methodology for running startups with the game theory to develop a series of acceleration programs. Their aim was to reduce the investment risk and increase the chance of success of the venture due to the possibility of conducting high-quality research and having quick access to the results. The paper was to become an important contribution to the discussion on startup accelerators among researchers and practitioners [Järvi et al., 2013].

A case study presented in 2014, on the collaboration between a crowdsourcing platform that connected students with employers and a startup accelerator from Chile, undertook an analysis of the reasons for the failure of the collaboration in expanding the company into new markets. It turned out that the reasons were cultural differences manifested in the methods of job search and remuneration. Through mentoring, it was determined that the company needed to change its business model, which should be based on principles adapted to the requirements of the South American market rather than the European market [Carmel and Káganer, 2014].

The information distribution policy and the selection of accelerated companies from the portfolio have also been the subject of analyses concerning startup accelerators. Taking into account the theory of rational expectations, it is shown that the selection and number of companies in the portfolio are below their respective effective values. In terms of information distribution, attention was paid to the disclosure strategy, especially in situations where only positive signals about companies are published, in particular those involving early exits [Kim and Wagman, 2014].

Some authors have also made comparisons of the status quo of startup accelerators in different countries. A comparative analysis between South Korea on the one hand and the United States, the United Kingdom, and Israel on the other was conducted. The research was carried out on the basis of interviews among the employees of the studied enterprises and secondary research. The objective was to determine the situation in Korea regarding the distribution of knowledge about startups, to identify success factors for accelerators, and to propose further actions in this regard. The research led to the following recommendations: promoting the creation of market-oriented accelerators by experienced business leaders, encouraging companies to expand globally by partnering with accelerators from abroad, supporting industry-specific accelerator initiatives, and developing and applying criteria for assessing accelerator effectiveness. The need to create an appropriate legal and institutional environment and to introduce tax concessions to remove external constraints on activity was emphasized [Seo et al., 2014].

In a 2014 article [Haines, 2014], the term "seed accelerator" appeared for the first time. The subject of this research was the Silicon Valley and its impact on technology development and entrepreneurial ecosystems around the world. Using surveys, interviews, and ethnographic methods, analyses of startup accelerator markets in South East Asia, Latin America, and developed markets were conducted. The aim of the research was to identify the theoretical and practical implications of accelerator operation on the micro and macro scales depending on local, geographical, and cultural conditions. The study focused on the conditions shaping the technological landscape, the possibility of mutual learning, and the influence of the Silicon Valley model on startup accelerators operating in other geographical regions. The possibility of adapting solutions adopted in the Silicon Valley model in the models of the respective countries was also examined. The general conclusion formulated by the author concerned the insufficient use of the potential of startup accelerators in decentralizing technology centers and supporting marginalized economies [Haines, 2014].

Publications dealing with corporate startup accelerators are an important resource. This topic was addressed in a 2012 article [Hilton, 2012], which discussed issues related to the program of Volkswagen's US division and the large technology startup accelerator called Plug and Play. As part of the program, selected startups from various industries working on cutting-edge automotive technologies were to be supported, including integration of mobile devices into vehicles, parking applications, visual computing, etc. [Hilton, 2012].

Two years later, a similar theme of seed accelerators was addressed in a book chapter. The author placed great emphasis on the need for a multidimensional study on the role of accelerators in regional entrepreneurial environments in the United States. He highlighted their societal importance in a number of key industries as a critical factor in increasing the long-term competitiveness of the US economy and also underlined the links between accelerators and industry clusters. The author pointed to the need for rigorous evaluation of the local impact of programs related to startup accelerators and the identification of growth drivers and the associated reallocation of companies and investment in the regions. He also mentioned the need to determine (a) which forms of support increase the availability of funding for startups and (b) which elements of the programs are most important for the success of an accelerator, taking into account both the accelerators themselves, as well as decision-makers, investors, founders, and participants of accelerators – especially since the concept of success can be defined differently by each of the entities mentioned. The need to establish what nonfinancial elements of local ecosystems are affected by acceleration was recommended for further research. This requires improving measures of the effectiveness of early-stage entrepreneurial activity by examining the impact of regionalization, such as cultural influences, population wealth, and the mechanisms of accelerators and their impact on startups in the region, on program outcomes [Hochberg, 2016].

After a 4-year hiatus, in 2016, the topic of seed accelerators returned in an article about an interdisciplinary business-and-technology center from St Petersburg's ITMO University. It was created for students and startup enthusiasts, and it aimed to integrate business incubators, startup accelerators, startups, and laboratory space by offering a comprehensive series of practical teaching projects with opportunities for further business or scientific development. The article gives an overview of the origins, mission, structure, studios, projects, and results achieved. The advantages, disadvantages, and benefits of collaborating with a student optical engineering research laboratory were reviewed [Ivashchenko et al., 2016].

Around the same time, another article was published with a case study analysis on the second edition of the Catalyze CU academic interdisciplinary accelerator program from the University of Colorado. The program was targeted at university-affiliated companies, and the solutions adopted in the program drew on best professional practices and other student accelerators. The article analyzed the functioning of the program from the point of view of the objectives pursued based on the results of surveys among its participants. The project was very well evaluated in terms of supporting solution presentation skills, but it was pointed out that the next edition would need to put more emphasis on developing the business and financial skills of startups, increase the involvement of local entrepreneurs, and focus on teaching teams to be more critical of their own projects [Komarek et al., 2016].

The issue of startup collaboration appears in an article that was published in 2017. The aim of the study was to identify sources of disruption to startups' collaboration with established companies in relation to innovations generated by accelerator programs. The analysis was carried out on the basis of Margaret Archer's social realist theory, which enables the conceptualization of participants' reflections, competition, and the "situational logic" of the conflict in which the participants reside. The main sources of conflict, as research has shown, are differences over core beliefs, power, autonomy, risk, and competition for resources and personal goals [Jackson and Richter, 2017].

In the same year, another case study on Deutsche Telekom's European accelerator program was published, examining the company's 5-year experience in managing this type of activity and its impact on the companies supported. The aim of the conducted analyses was to identify the success factors of acceleration programs. The primary research method comprised interviews and academic collaboration with the accelerator. These helped to identify the key success factors for the programs, such as clear and well-defined objectives, a large network of partners involved in the program, and appropriately selected performance indicators. The factors increase the chance of success by intensifying cooperation between startups and corporations, in addition to contributing to job creation [Kupp et al., 2017].

Implementing accelerator programs involves choosing specific marketing strategies. An article published in 2017 analyzed the use of digital marketing (DM) strategies by startup accelerators. The subject of the study was the objectives and channels in DM, and it was carried out using correlation analysis and statistical significance tests, thus establishing relationships among variables such as organization profile, DM objectives, and DM channels. The way in which a specific type of accelerator shapes its DM was shown. The findings should help to design a framework for selecting a DM strategy appropriate for the program, thus increasing its social added value [Azinheiro et al., 2017].

The aim of the next study was to define a conceptual framework for scouting startups to identify and select the most promising ones for collaboration. The research was conducted on the basis of expert interviews and questionnaire survey. The result was a distinction between seven areas of action broken down into three levels: executive, management, and ambassador. To validate their functionality, the authors tested the management level by applying scouting within an accelerator partnership program with a company venture capitalist. They also encourage in-depth, particularly quantitative, studies of the process to ensure that it is thoroughly understood and can be monitored [Heinz et al., 2017].

A very interesting paper is based on research conducted on the analysis of changes in engineering education outcomes introduced by the US Accreditation Board for Engineering and Technology. The aim of the research was to identify which of the essential competencies required of engineers have been overlooked as a result of these changes. The assessment was based on interviews with education researchers and a number of entrepreneurs, including leaders of startup accelerators from Chile, Colombia, the United States, Spain, and the United Kingdom, among others. Interviewees cited the current engineering skills that are

worth strengthening, singling out those relevant to working in and setting up startups. The conclusions section makes recommendations to the Accreditation Board and outlines plans for future quantitative research [Hilliger et al., 2017].

Quite detailed analyses of the functioning of startups have been carried out in Spain and Germany in the context of the changes that took place in Europe after 2008. Based on an analysis of the changes that have taken place in the mobility of young professionals and the adaptation of entrepreneurial culture in the contemporary labor market as a result of the financial crisis, the economic, demographic, and institutional causes of the phenomenon of startups were identified. The sociodemographic profile of a business startup was presented and the relationship between the budding entrepreneur and the nature of his/her business was established. A complex research methodology was used for this purpose, including analyses of statistics, regulations, accelerator data, and ethnographic research (virtual ethnography) [Sota and Farelo, 2017].

All this is summarized in a publication dealing with the institutional aspects of startups. Based on a case study analysis, the way in which startups negotiate and implement institutional change is explored and explained. The study was conducted during the implementation of service innovations in the rather conservative health-care industry. Interviews and analysis of documents from ventures within acceleration programs were used. The conclusions presented identify the key processes involved in institutional change, thus developing the theory of institutional entrepreneurship. The conclusions section suggests more frequent reference to this theory when studying service innovation and summarizes the observations from a practical point of view [Wallin and Fuglsang, 2017].

As far as technology is concerned, the experience gained in the creation of the European Internet of Things (IoT) Startup Scaleup ecosystem is presented in an article on academic accelerators of technology startups and incubators from Spain, the Netherlands, Lithuania, and Ireland. Recommendations were made for other technology entrepreneurship programs based on an analysis of the development and participation of an accelerator from the Technical University of Cartagena, compared to other countries. The contribution of the university, that is, the experience in project management and the opportunities arising from the expertise of academic Information and Communications Technologies (ICT) research, and other partners in terms of access to internationalization tools, investors, funding, business knowledge, etc., was highlighted [Iborra et al., 2017].

In addition to studies and analyses dealing with selected issues of the functioning of startups, the year 2017 also saw articles containing the results of research conducted from a holistic perspective. An in-depth literature review supported by the results of a survey of accelerator managers and statistical research provide a background to such research. The aim was to organize knowledge about different types of startups and other ways of supporting entrepreneurship. In addition, the characteristics of accelerator programs and their future challenges were presented. As a result, an overview of accelerators as well as their business models and strategies was provided [Carvalho et al., 2017].

The surge of interest in startups came at the start of 2018. One of the more interesting works is a publication that discusses corporate accelerators in relation to the agribusiness, ag-tech, and food industries and the concept of Responsible Innovation (RI), including issues of social good and public interest when considering new ideas. Based on the experience of Alltech's Pearse Lyons accelerator, the impact of accelerators on startup ecosystems, as well as their implementation and coordination practices, is analyzed taking into account the goals and objectives of all stakeholders. The most important lessons related to the construction and implementation of accelerators are included in the acronym IGNITE: I – intensity, G – group, N – neighborhood, I – independence, T – transparency, and E – expertise. These principles should help corporations understand programs targeting ag-tech startups and lead to more sustainable agricultural practices [Connolly et al., 2018].

Another publication from that year included the findings of a study devoted to managers of corporate accelerators, but in the context of industrial startups. Based on an inductive case study in a seaport complex, a framework for designing and running an industry-oriented startup accelerator was developed. The framework is contained in the following four steps: orchestrating the ecosystem, generating an innovation funnel, flexible alignment, and scaling the corporate startup [Garcia-Herrera et al., 2018].

The topic of startup accelerators has been also increasingly appearing in monographs. The authors investigated the motives behind the activities undertaken by corporations toward startups, using qualitative research (review of secondary data) and interviews with corporate managers. Nine basic motives for cooperation were formulated, among which some of the most important are the corporation's problems with internal innovation or creating appropriate culture. In addition, the latest trends in the development of this field were presented, and emerging forms of cooperation between corporations and startups, such as accelerators, incubators, events, hackathons, etc., were identified, stating that the phenomenon is an extension of outsourcing [Jung, 2018].

Another publication of this type dealt with success factors of accelerators based on a case study of a startup support institution with experience of running 12 acceleration programs. It was determined that the design of a differentiated benefit proposition for startups based on the capitalization of corporate assets and a defined process for managing the relationship between the corporation and startups were responsible for the success of the program. Dedicated business developers [Ruseva and Ruskov, 2015] are expected to play a helpful role in achieving this, ensuring alignment of interests and information sharing in collaboration with external companies [Mahmoud-Jouini et al., 2018].

Based on research conducted through abductive reasoning, consisting of an extensive literature review and a series of interviews with startup employees and managers of corporate companies and accelerators, the authors of article discussed and explained the genesis of the key features of corporate acceleration programs. Using a standard holistic systematization, they distinguished such program features as strategy, resources, roles, and structure, which were then used to analyze and evaluate data gathered from stakeholders. The resulting findings are expected to feed into theoretical and empirical knowledge about the operation of acceleration programs, helping to justify the existence of programs by better understanding the expectations placed on them [Richter et al., 2018b].

One of the chapters in a book published in 2018 [Richter et al., 2018a] presented an approach to the issue of startup accelerators, which starts a discussion with the views presented so far by the authors. It negates a one-size-fits-all attitude toward startup accelerators, proposing instead a checklist for building the right individual framework for working with each startup, taking into account the people, processes, and culture involved. This approach counterbalances the "key success factors" identified in other publications [Richter et al., 2018a].

A publication that can be categorized as "all-accelerator" came out in 2018 [Seet et al., 2018]. A case study investigating the interaction of three processes in a startup accelerator, namely, "know-what", "know-how", and "know-who", analyzed the enhancement of human capital with social capital. The results of the study showed the interconnectedness of the above-mentioned processes, with "know-who" being proven to be the most important for participants' learning and closing the loop for "know-what" and "know-how" – by knowing "who", participants learned "what" and "how" through social learning. Furthermore, the role of mentors and experts in shaping learning and developing entrepreneurship was emphasized. Thematic analysis of interviews with participants in an Australian accelerator, guided by Design Thinking, Business Model Canvas, and Lean Startup concepts, among others, was used as the research method [Seet et al., 2018].

Subsequent studies dealt with empirical conclusions about the real opportunities for startups and accelerators at the social, economic, and territorial levels, in addition to the model of startup impact on the creation of new companies and jobs. Based on detailed information on 116 entities, derived from the Seed Accelerators Knowledge Base and supplemented by data obtained from entrepreneurs, accelerator owners, and investors, approximate numbers of jobs offered by startups were estimated, thus juxtaposing expectations with reality. It was also found that accelerators in the United States are the strongest stimulators of new ventures and hence new jobs. Leading authors on this topic are L. Cánovas-Saiz, I. March-Chordà, and R.M. Yagüe-Perales – Spaniards who gained pioneer status by quantitatively analyzing the performance of accelerators and seed startups in terms of the employment they generate [Saiz et al., 2018].

The subject of research in another study, based on empirical data, was how accelerators select startups. The study was carried out using the example of a seed accelerator in South East Asia and a group of several companies aspiring to participate in its programs. The company profiles along with the selection results

were compared using real-win-worth criteria, and regression models predicting the selection results were subsequently constructed. The models developed can be used to help accelerator managers improve their own decision-making processes [Yin and Luo, 2018].

Similar in nature was the research presented in the paper on the interdependence of three subsystems of the entrepreneurial ecosystem and several types of accelerators, identifying the unique places and roles of each in the wider entrepreneurial ecosystem [Yang et al., 2018]. A pipeline model was proposed as a tool for decision-makers to distinguish between entrepreneurs and their ventures and to map subsystems for evaluation and management. For entrepreneurs, on the other hand, the model was intended to enable locating their startups in a wider ecosystem and choosing which accelerator they could apply to. This research complemented existing knowledge with better differentiation of accelerators, the value they can bring, and thus also the expected results of acceleration. The findings presented in this paper provide additional assistance to accelerator managers [Yang et al., 2018].

Then, there was another attempt to systematize the various forms of CV by reviewing and organizing the literature on the subject. The author analyzed and unified the framework of metrics proposed by other authors to categorize CV forms according to the innovation flow [Gutmann, 2019].

In another article, the same author attempted to highlight the benefits of startups working with accelerators. An inductive case study was used for a newly established SAP Industry 4.0 Startup Program for one of the world's largest business software vendors. The research conducted was qualitative in nature. The range of benefits for startups included accelerated product market debut, increased sales, development of skills and knowledge, and streamlined business development in terms of strategy, business model, pitching, financing, and partnerships [Gutmann et al., 2019].

Successful engagement of technology startups and clarification of the operation and essence of corporate accelerators and incubators has been the subject of research by authors of many publications. One such paper identified corporate expectations of accelerator programs and the way in which startups can effectively benefit from such programs, based on qualitative research and interviews with representatives of 17 German incubators and accelerators [Kohlert, 2019].

Another article reviewed four types of corporate accelerators, juxtaposing their objectives and differentiators as part of a guide for managers faced with choosing the optimal program for their organization. The research was conducted on the basis of secondary data and interviews containing opinions of representatives of companies and accelerators. The criteria for dividing accelerators by type included the number of participants and management structure [Moschner et al., 2019].

A paper based on interviews with experts from 16 German accelerators identified five types of accelerators, guided by differences in the support provided, selection of startups, and finalization of programs. The aim of the research was to explain the heterogeneity of the ecosystems built by corporate accelerators. The systematization made, in addition to its research value, provides guidance for the design and positioning of accelerators in relation to corporate strategy [Prexl et al., 2019].

The year 2019 was summarized by an article that identified the basic processes of corporate acceleration to explain the reasons for running and designing corporate accelerators. The induction method used established that, depending on the strategic stance and the time horizon of the investment, the accelerator can be oriented toward accelerating either strategic fit or venture creation [Shankar and Shepherd, 2019].

Among the six studies that followed was an article describing the impact of accelerator programs in promoting international entrepreneurship. Qualitative analysis of one accelerator pointed to the intermediary role of accelerators, facilitating startups to establish better relationships within business networks that attract entrepreneurs. Networks that are intensively used by companies profiting from a wide range of business fields and backgrounds help to maximize accelerator opportunities. The article raises concerns about government attempts to replicate similar schemes in the public sector, noting the problematic nature of their operation in weaker entrepreneurial ecosystems [Brown et al., 2019].

For the purposes of research, a panel of 405 meetings organized by startups participating in an international accelerator program was created using various sources, and the results were shown in another article [Bustamante, 2019]. The study incorporated transaction costs, the resource approach, and

institutional theories. The results obtained clarified the importance of contracting capacity and institutional distance when deciding on in- and outsourcing. Contracting potential and institutional distance shape the relationship between transaction costs and the functioning of startups. Decisions to develop startups vary according to their origin because company and country specificities, in addition to transaction costs, significantly influence startup management [Bustamante, 2019].

The increasing role of accelerator programs in entrepreneurial ecosystems was also raised by many authors, with particular emphasis on the fact that there are differences among accelerators despite their fixed defining characteristics. The authors in question compared key differences in the antecedents of organizational designs with theoretical company-level outcomes, thus establishing descriptive correlations between elements of these designs and the performance of startups participating in programs. This helped to establish links between design and performance, enabled integration with previous research on the topic, and increased the understanding on the role of a startup intermediary. The results of this work defined the building blocks and agenda for future research leading to a better understanding of accelerators [Cohen et al., 2019].

The general attitude toward innovation and the propensity for open and sustainable innovation was addressed by a study conducted in Portugal. It used the HJ-Biplot graphical method to analyze data from the Community Innovation Survey (CIS). The findings showed that companies engage in many activities with poor results and should better select partners to implement and disseminate more ideas. The results obtained highlight the importance and value of startup accelerators from the perspective of Industry 4.0 or smart cities [Fernandes and Castela, 2019].

Authors of studies on startup accelerators and crowdfunding, who examined the progress of entrepreneurship in Thailand (especially toward the so-called "Thailand 4.0" concept) and corresponding developing economies, came to a similar conclusion. Focusing on the main accelerator programs and the startup eco-innovation system, the problems were located in a triple helix model consisting of the interaction among universities, industry, and government. This interaction did not prove strong enough to commercialize technologies effectively. Mediation by accelerators on the market was to be the remedy [Harris and Wonglimpiyarat, 2019].

A conference paper presented the Astropreneurs space startup acceleration program, its first results, lessons learned, and the state of the European space industry. Much attention was paid to the role and importance of startups in the development of the industry [Kunes, 2019].

One of the articles undertook research to present and organize the state of knowledge about startup accelerators at the time, to identify existing trends and gaps in the literature, and to guide future research. Similar objectives are pursued in the present study, which also uses bibliometric analysis. In that study, however, 21 articles from Web of Science database resources from 2010 to 2019 were included [Guijarro-García et al., 2019].

Criticism of accelerators was resumed by researchers, only this time in relation to the territorial concept of the entrepreneurial ecosystem. A 2019 article promulgated a broader topological conception, defining entrepreneurship as a practice shared by different regions and only partially embedded in each [Kuebart and Ibert, 2019]. By examining the flow of knowledge between seed accelerator ecosystems from three countries and its spatial dynamics, the authors found – through case studies – that territorialism downplays disruptive practices of the digital economy. What is not taken into account is that these practices enable startups in this industry to communicate business and technological information in ways not possible in traditional knowledge clusters [Kuebart and Ibert, 2019].

The reasons for the success of technology startups were also investigated in a publication that presented case studies involving four cleantech companies. It analyzed the drivers of a product's rapid market success by comparing two companies that entered the market with the help of accelerators with two others that did not benefit from this form of support. On this basis, it was determined that the mechanisms offered by accelerators rely on the assumption that a short debut time is a prerequisite for the survival of a company, which necessitates access to a network of resources, while the role of the accelerator is to bridge shortcomings in inexperienced entrepreneurs. The results of this work may prove valuable in designing and implementing effective acceleration programs [Stayton and Mangematin, 2019].

The theme of startups in academic practice returned in three papers in 2019 [Glinik, 2019a, 2019b; Poandl, 2019]. The first one demonstrated good practice using the example of *Gruendungsgarage*, an academic interdisciplinary startup accelerator under the auspices of two Austrian universities. The study analyzed the development of the institution from an optional course, offering expert support in the implementation of student business ideas, to a professional academic startup accelerator that also accepted initiatives from academics [Glinik, 2019b].

Another article by the same author included a comprehensive report on the activities of an academic accelerator, highlighting that the program grew considerably during its 10-year existence, generating interest among other educational institutions [Glinik, 2019a].

The third paper on academic accelerators, like the previous two, presented an academic accelerator as an example of best practice in entrepreneurship education. It also featured a practical model for categorizing accelerated startups based on the level of digitization of their projects. The paper presented some examples of startup classifications and conclusions about the practical aspects of engineering entrepreneurship education. Directions for future research were also suggested [Poandl, 2019].

Other studies on academic accelerators addressed the integration of the entrepreneur–coach relationship and lean startup methodologies. An ethnographic approach was used in the research. It was found that lean startup influences whether and how such relationships evolve and how this facilitates learning among entrepreneurs. A disjunction between the opinions of the customers and the authority of the coach were apparent in the study. In response, the publication suggested how to deal with this and similar challenges [Mansoori et al., 2019].

Another article devoted analysis to the role of startups and startup accelerators for the Silesian Metropolis and dealt with their significance for the construction of metropolitan centers. The authors outlined how accelerators provide tremendous support to emerging companies, especially early-stage high-tech startups, providing services such as office space, mentoring, networking, and a variety of educational programs. Another objective pursued by the authors was to explain the variation found among accelerators. The paper revealed that the configurational approach with respect to notions of ideal type, or "fit", can be used to explain the existence of several accelerator categories [Kwiotkowska, 2019].

Another space startup report was presented in 2020. It presented the results of an accelerator pilot program run in collaboration between Starbust Aerospace and Techstars, a leading corporate accelerator, with funding from industry and government support, namely, the National Aeronautics and Space Administration (NASA). The program involved 10 companies and aimed to procure innovations for the Jet Propulsion Laboratory (JPL) for future missions [Cwik et al., 2020].

One author who repeatedly addresses the topic of corporate accelerators and draws attention to their role in providing adequate resources to startups is Gutman. He ranked program aspects based on research from one of the largest institutions of its kind, Telefonica's German Wayra accelerator, and suggested necessary operational improvements [Gutmann et al., 2020].

Germany was also the site of research related to the effectiveness of corporate entrepreneurship programs, both in the preparatory phase and throughout their duration. The research was based on interviews with managers of incubators and accelerators of leading technology companies. The rationale that synergies increase the effectiveness of running multiple activities in parallel, enabling better utilization of resources, was verified [Heinzelmann et al., 2020].

Family accelerators also attracted the attention of German authors. They pointed out the specific nature of their operation resulting from family involvement, presented accelerator programs unique to family businesses, and provided conclusions about the importance of such accelerators to the industry [Pielken and Kanbach, 2020].

The next work was intended to contribute to a better understanding of the corporate–startup relationship and to recommend improvements in the management of corporate accelerators, making them more effective. The research was based on the analysis of 10 case studies in terms of emotional dynamics from a systems psychodynamic perspective. The study included the points of view of both a corporation and a startup [Wójcik et al., 2020].

The issue of learning through working in startup teams and as a result of interactions among startups, accelerators, and investors was addressed in two further articles. The first one focused on learning through operations embedded in lean startup methodologies, based on research from 152 teams supported by the US government's National Science Foundation (NSF). Citing the results, the authors found that hypothesis formulation and the probing and convergence of ideas integrate well in teams. They also noted that qualified Master of Business Administration (MBA) graduates are reluctant to apply the method before learning it but find it valuable after they have followed it. This leads to the conclusion that business education of team members is a critical boundary condition and that business theory limits business practice, favoring learning by thinking. The authors implied that lean startup is considered too universal, resulting in poor testing and disregard for possible critical values. At the same time, they suggested that its implementation can improve company performance over an 18-month period [Leatherbee and Katila, 2020].

The second article presented the results of a study on interactions among startups, accelerators, and investors. The model, built in accordance with the game theory, explained how accelerators prioritize their services and how macroeconomic conditions and legislation affect their operation and performance. The analyses showed that, in general, the screening service is the most important and, in the face of limited resources, it should also have the highest priority, preceding mentoring and investing. The impact of the heterogeneity of entrepreneurial ecosystems at the macro level on their effectiveness was also demonstrated to be higher in less-developed regions [Zarei et al., 2020].

The theme of seed accelerators returned in 2020 in research carried out by scientists in Spain. In the article, they highlighted the key role of seed accelerators in the operation of entrepreneurial ecosystems. The aim of the research was an exploratory evaluation and determination of the impact on entrepreneurial prospects based on the developed model and survey data collected from 116 companies from the industry. The model was designed based on the literature on business incubators. The model formulated four categories of variables: size, location, age, and profitability, from which two empirically tested hypotheses were derived. Once again, a statistically significant size and performance advantage was demonstrated for accelerators in the United States and those with the longest market experience. The results of the study can provide guidance to policy makers, shareholders, entrepreneurs, and investors. Investors may be interested in the rate of return, duration, and investment rounds needed to exit. They should especially appreciate the established performance metrics. Startups, on the other hand, can learn about the requirements placed on them in acceleration programs, while policy makers can see the intervention potential of accelerators in small entrepreneurial ecosystems. The authors referred to their earlier work, emphasizing that the creation of new accelerators contributes to the creation of new jobs [Cánovas-Saiz et al., 2020].

Another publication from the year 2020 examined the prioritization of criteria that seed accelerators use to select projects, based on an analysis of a sample of 309 actual startup proposals, 15 of which progressed to the acceleration phase. Purely business factors related to the project itself (innovativeness, possibility of obtaining further rounds of funding, etc.) and management skills (negotiation skills, communication skills, etc.) were taken into account. Team cohesion, acceleration speed, leadership, and creativity were shown to be the most relevant criteria [Mariño-Garrido et al., 2020].

As in previous years, the theme of academic accelerators was also taken up in 2020. Based on a case study on an academic acceleration program in Egypt and literature research, a model was developed to fill the research gap and provide practical assistance by presenting a framework for the design process of acceleration programs. The model incorporated the process of designing, monitoring, and personalizing the program based on internal factors, namely, accelerator capabilities and resources, and external factors related to the entrepreneurial ecosystem. A set of design parameters, such as sectoral focus, duration, services offered, etc., was formulated [Ismail, 2020].

The next article also investigated a model, but this time concerning collaboration between startups and corporations. Accelerator programs that enable large companies to access innovations to increase product competitiveness or process productivity by engaging in collaboration with startups were studied. This paper examined the rationale for implementing such programs and identified their key elements. It also indicated how companies could run them effectively. A startup collaboration model was described as a

complement to current tools for engaging corporate accelerators and corporate funds investing in startups [Kurpjuweit and Wagner, 2020].

Building on a case study and interviews with practitioners in Oulu, Finland, on the role of incubators, accelerators, co-working spaces, mentoring, venture capital funds, and various events in the startup ecosystem, the types of startups were presented and the similarities and differences between them and the types of ventures they focus on were characterized [Tripathi and Oivo, 2020].

A monograph was produced at the same time, which presented a systematic literature review focusing on the functioning of technology transfer in corporate accelerators. It resulted in the development of a model based on the analysis of the absorption capacity of accelerators from numerous case studies [Gür, 2021].

Another paper provided guidance on enhancing organizational learning and innovation performance of established companies. In this way, it fills a gap in existing research on the issue of overcoming difficulties arising in different phases of corporate acceleration. The research was based on a series of interviews with innovation experts in various industries working in one of the largest European accelerators of its kind [Hutter et al., 2021].

Contemporary practices in corporate and startup collaboration and Open Innovation (OI) in Europe were the focus of another group of researchers. The aim of the research was to identify good practices, trends, and barriers in such relationships. The companies analyzed were considered leaders in innovation and effective corporate–startup cooperation. Six key areas of OI activity were identified and compared according to the required commitment of resources from the corporation. The results indicated that one-off activities such as organizing single events or providing free resources are the most popular and least demanding, while startup acquisitions are the rarest and most engaging [Onetti, 2021].

Polish researchers have also contributed to the research on startup accelerators. The main objective of their research was to determine the motivations behind running corporate accelerators and the accompanying benefits and challenges. In-Depth Interviews (IDIs) with accelerator managers, focus group interviews, and secondary data were used. Numerous benefits of accelerators were confirmed, as well as their initiation significance in terms of the emergence and development of innovations [Urbaniec and Żur, 2021].

The year 2021 has been full of new publications despite the problems caused by the coronavirus disease (COVID-19) pandemic. There was an article in which the authors deal with the concept of ecosystems and clusters, looking at their role in the growth of the life science/biopharma industry. The paper presented the theoretical underpinnings and case studies of ecosystems emerging in the United States, Europe, and Australia. It also included a number of predictions about the future of collaborative and digitally supported innovation in the aforementioned industries, in the context of recent experience with the COVID-19 pandemic [Boni and Gunn, 2021].

Qualitative research was used to determine the impact of a startup accelerator's reputation on its information policy in terms of notifying investors about the quality of its activities. It was observed that the motivation to evaluate ventures honestly and conscientiously and to inform investors depends on the severity of potential image and economic losses resulting therefrom [Charoontham and Amornpetchkul, 2021].

With the help of ethnographic data, interviews, and publications, the activities of the MindCET R&D unit, which runs, among other things, a startup accelerator, were analyzed to determine the impact of reforms in the Israeli education system. The authors analyzed the approach of the entity taken from the business theory of disruptive innovation, which was manifested in its work on educational change. Ultimately, it was concluded that MindCET prioritized working through disruption modes rather than promoting intrasystemic change, thereby creating conditions of readiness for disruptive change in education [Ramiel, 2021].

A study of the performance factors of accelerators in Silicon Valley was addressed in a work that emphasized sustainability and recognized the weaknesses and needs of the Nigerian economy. A multiple regression analysis method was adopted to synthesize existing knowledge, complementing it with numerous case studies. A theory of "sustainable growth of startups" was derived and proven based on the results of the analysis. It assumed that the quality of acceleration is more important than the number of supported startups, and accelerators should specialize in a given economic sector [Shenkoya, 2021].

A comprehensive literature review study prepared by a systematic revision of 98 publications was published in the year 2021. It presented the operation of startup accelerators and their role in supporting entrepreneurship and innovation. The methodological framework of the review was based on the Context–Intervention–Mechanism–Outcome (CIMO) model. Four mechanisms were seen in the activities of startup accelerators: validation of ideas and products, product development and model learning, support for startup growth and market access, and support for innovation. Methodological and theoretical gaps in current research and ways to support future ones with industry practice were identified [Crișan et al., 2021].

The year 2021 brought another paper on academic startups. It outlined the entrepreneurial ecosystem at Aalto University, consisting of student startups supported by faculty and staff, as well as external stakeholders involved in the program. It also made a suggestion for the adaptation of the ecosystem by other academic centers and called for further research in this area [Ainamo et al., 2021].

A new form of accelerator, exemplifying the evolution of these entities in response to changing global needs, was presented in another 2021 article. It addressed the topic of impact accelerators. Such accelerators are designed not only to achieve economic benefits but also to operate in a sustainable manner. Focusing on the selection process of startups and the accompanying criteria, major differences were identified compared to the practices used and known in purely commercial programs [Butz and Mrożewski, 2021].

Taking into account the above-mentioned research, it can be concluded that the past decade saw a dynamic development of a new form of entrepreneurship support through startup accelerators, which run programs for new ventures of limited duration (usually from 3 months to 9 months). Accelerators offer a structured development process for projects at various stages of development, which, according to the study, may include an educational component, pitching, intensive mentoring, space along with infrastructure, verification of business assumptions and value propositions along with business model refinement, product building and testing, relationships with business partners and accelerator program alumni, demo day, and sometimes subsequent funding rounds.

The research carried out showed that, depending on the form of activity adopted, accelerators provide different types of support and apply different project selection criteria. This also led to the identification of differences in the accelerator programs run, each of which is optimized to meet its objectives. Corporate accelerators, for example, operate in line with designated areas relevant to the strategy of a large enterprise. This could provide the foundation for a subsequent investment policy for the operation of a corporate fund investing in startups in the future. In contrast, accelerators run by private investors, often in partnership with venture capital funds, focus on maximizing profits. This is why, depending on the adopted formula, accelerators achieve different results in the supported startup projects and therefore startup founders should read the conditions of the accelerator and adjust their objectives to the accelerator's and its partners' goals before choosing an accelerator and joining the implemented program. The above analysis results can guide future researchers, policy makers, and practitioners who seek to investigate the impact of accelerators and the programs they run on the entrepreneurship and commercialization of startup solutions, as well as to understand the phenomenon of accelerators and their role in the global innovation ecosystem.

4 Bibliometric analysis

4.1 Number of publications per year

The first publication on startup accelerators appeared in the Scopus database in 2011 [D'Eredita et al., 2011]. The first 3 years (2011–2013) showed a steady trend, with one article on startup accelerators per year. The year 2014 showed an increase to four publications, while 2015 again saw one publication. An upward trend could be observed from 2015 to 2019, with more publications in each of those years. In 2020, there was an apparent decrease in the number of publications on this topic, most likely due to the COVID-19 pandemic. In 2021 (as of the end of July), 12 publications were identified. Table 1 details the number of publications by year of publication.

Table 1. Number of publications per year

	Years	Publications
1.	2011	1
2.	2012	1
3.	2013	1
4.	2014	4
5.	2015	1
6.	2016	5
7.	2017	9
8.	2018	10
9.	2019	20
10.	2020	12
11.	2021	12
	Sum	76

Table 2. All countries sorted by the TC value

Rank	Country	TP	TC	TC/TP
1	The United States	19	322	16.947
2	Germany	15	120	8.00
3	Australia	4	47	11.75
4	France	3	42	14.00
5	Norway	2	27	13.50
6	The United Kingdom	3	23	7.667
7	Chile	3	20	6.667
8	Switzerland	2	16	8.00
9	Sweden	1	16	16.00
10	Finland	4	12	3.00
11	Denmark	2	10	5.00
12	Spain	8	10	1.25
13	Singapore	1	10	10.00
14	Romania	1	6	6.00
15	Austria	6	4	0.667
16	Bulgaria	1	3	3.00
17	The Russian Federation	1	3	3.00
18	Israel	1	3	3.00
19	Italy	1	3	3.00
20	Portugal	3	2	0.667
21	Egypt	1	1	1.00
22	Poland	3	1	0.333
23	Estonia	1	0	0.00
24	Iran	1	0	0.00
25	South Korea	3	0	0.00
26	The Czech Republic	1	0	0.00
27	Thailand	1	0	0.00
28	Turkey	1	0	0.00

TC, total number of citations; TC/TP, average number of citations per paper; TP, total number of papers.

4.2 Countries with the highest rate of productivity

Table 2 shows the countries of origin of the authors studying startup accelerators. For the purpose of this study, the TP, the TC, and the TC/TP values were analyzed.

The United States is ranked the highest, as researchers from that country wrote 19 articles that were cited 322 times. This translates into 16.947 citations per article. Scientists from Germany are the next most

productive researchers. They wrote 15 articles that were cited 120 times. This translates into 8.000 citations per article. In addition to these countries, the countries with the highest number of citations per article included Sweden (16.000), France (14.000), Norway (13.500), Austria (11.750), and Singapore (10.000). Interestingly, the highest number of publications comes from countries with strong and modern economies that invest in the development of modern technologies. To get a better understanding of the above study, one must take a look at the world's largest startup market, the United States. The largest number of innovative companies, venture capital funds, and accelerators are located and appear there every year. This is the market with the highest number of capital investments, which thus shows the disproportion between the United States and the European Union. The United States is home to many regional startup ecosystems (Silicon Valley including San Francisco, New York, Boston, Seattle, Houston, and Los Angeles). The position of the United States stems from the fact that this market began to develop much earlier than in other countries, such as Israel, Germany, the United Kingdom, or China. Other factors include the size of the internal market and the wealth of citizens. Synergy with science through strong, internationally recognized academic centers and their cooperation with business is also an indispensable element.

4.3 Most common startup accelerator research

The review of 76 publications shows that corporate accelerators are the most frequently analyzed research topic. As many as 27 of the 76 research papers analyzed focus on them. Seed accelerators and academic accelerators are also discussed. Other articles discuss the operation of startup accelerators and analysis of accelerator programs, among other things. Aspects of geographical location, funding, and OI are covered.

4.4 Most productive sources

The 76 publications under analysis were published in 64 sources (journals, conference monographs, and books). This means that 12 sources published two publications each on startup accelerators (11 journals and 1 conference monograph). Table 3 shows all sources that published articles on startup accelerators with the number of citations. The average citations per paper (TC/TP) are also presented.

The interdisciplinary nature of the sources studied is noteworthy. They often cover more than one research area. The following research areas were distinguished among the sources of publications on accelerators: business, management, and accounting (n=50); technical studies (n=25); economics, econometrics, and finance (n=19); social sciences (n=12); informatics (n=11); decision theory (n=5); earth sciences and planetology (n=2); environmental sciences (n=2); materials research (n=2); mathematics (n=2); physics and astronomy (n=2); agricultural and biological sciences (n=1); biochemistry, genetics, and molecular biology (n=1); energy (n=1); and medicine (n=1).

All publications published in the 64 sources were cited a total of 564 times. The highest ranking was *Business Horizons*. It is a journal with a CiteScore of 11.3 and Journal Impact Factor (JIF) of 6.361, ranking it 43rd out of 153 journals in the Business category. It is available in 30 international databases. Two articles cited 125 times were published therein. This translates into 62.50 citations per article [Kohler, 2016; Moschner et al., 2019]. One article was published in the American scientific journal *Innovation Policy and The Economy* and was cited 68 times [Hochberg, 2016].

4.5 Authors with the greatest productivity

The 76 publications analyzed were written by 167 authors. The vast majority are multiauthored works. There are 15 publications that have a single author [Hilton, 2012; Hochberg, 2016; Kohler, 2016; Jung, 2018; Bustamante, 2019; Glinik, 2019a, 2019b; Gutmann, 2019; Kohlert, 2019; Kunes, 2019; Poandl, 2019; Ismail, 2020; Gür, 2021; Ramiel, 2021; Shenkoya, 2021]. Table 4 shows all authors who published articles on startup accelerators with the number of citations. The average citations per paper (TC/TP) were also calculated.

The author with the highest number of publications is D.K. Kanbach, responsible for four publications cited 38 times [Kanbach and Stubner, 2016; Gutmann et al., 2019, 2020; Pielken and Kanbach, 2020]. This

Table 3. All sources sorted by the TC value

Rank	Sources	TP	TC	TC/TP
1	*Business Horizons*	2	125	62.50
2	*Innovation Policy and The Economy*	1	68	68.00
3	*Journal of Applied Business Research*	2	33	16.50
4	*Research Policy*	1	32	32.00
5	*Journal of Business Venturing*	1	25	25.00
6	*Journal of Technology Transfer*	2	24	12.00
7	*Journal of Corporate Finance*	1	24	24.00
8	*Journal of Business Strategy*	2	21	10.50
9	*Creativity and Innovation Management*	1	18	18.00
10	*Technovation*	1	18	18.00
11	*European Planning Studies*	1	17	17.00
12	*International Journal of Innovation Management*	2	15	7.50
13	*Entrepreneurship Research Journal*	2	14	7.00
14	*Asia Pacific Business Review*	1	14	14.00
15	*Management Review Quarterly*	1	13	13.00
16	*IEEE Transactions on Engineering Management*	2	10	5.00
17	*Journal of Business Research*	1	9	9.00
18	*Journal of Service Management*	1	9	9.00
19	*Research Technology Management*	1	7	7.00
20	*Strategic Entrepreneurship Journal*	1	7	7.00
21	*International Food and Agribusiness Management Review*	1	6	6.00
22	*ASEE Annual Conference and Exposition, Conference Proceedings*	2	5	2.50
23	*CEUR Workshop Proceedings*	1	4	4.00
24	*International Journal of Intellectual Property Management*	1	4	4.00
25	*Learning, Media and Technology*	1	4	4.00
26	*Problems and Perspectives in Management*	1	4	4.00
27	*Zeitschrift fur Wirtschaftsgeographie*	1	4	4.00
28	*California Management Review*	1	3	3.00
29	*International Journal of Innovation and Learning*	1	3	3.00
30	*Proceedings of SPIE – the International Society for Optical Engineering*	1	3	3.00
31	*Proceedings of the ACM Conference on Computer Supported Cooperative Work*	1	3	3.00
32	*Proceedings of the European Conference on Innovation and Entrepreneurship, ECIE*	1	3	3.00
33	*International Journal of Engineering Pedagogy*	2	2	1.00
34	*International Journal of Entrepreneurship and Innovation Management*	2	2	1.00
35	*Journal of Business Economics*	1	2	2.00
36	*R and D Management*	1	2	2.00
37	*Entrepreneurial Innovation and Leadership: Preparing for a Digital Future*	1	1	1.00
38	*Entrepreneurship and Regional Development*	1	1	1.00
39	*European Journal of Management and Business Economics*	1	1	1.00
40	*IEEE International Symposium on Industrial Electronics*	1	1	1.00
41	*International Entrepreneurship and Management Journal*	1	1	1.00
42	*Proceedings of International Design Conference, Design*	1	1	1.00
43	*Proceedings of the International Conference on Industrial Engineering and Operations Management*	1	1	1.00
44	*Advances in Intelligent Systems and Computing*	2	0	0.00
45	*FGF Studies in Small Business and Entrepreneurship*	2	0	0.00
46	*Academic Entrepreneurship and Community Engagement: Scholarship in Action and the Syracuse Miracle*	1	0	0.00
47	*Academy of Entrepreneurship Journal*	1	0	0.00
48	*African Journal of Science, Technology, Innovation and Development*	1	0	0.00
49	*Annals of DAAAM and Proceedings of the International DAAAM Symposium*	1	0	0.00
50	*Automotive Industries AI*	1	0	0.00

(*Continued*)

Table 3. Continued

Rank	Sources	TP	TC	TC/TP
51	*CIRIEC-Espana Revista De Economia Publica, Social Y Cooperativa*	1	0	0.00
52	*Economics of Innovation and New Technology*	1	0	0.00
53	*Fundamentals of Software Startups: Essential Engineering and Business Aspects*	1	0	0.00
54	*IEEE Aerospace Conference Proceedings*	1	0	0.00
55	*IOP Conference Series: Materials Science and Engineering*	1	0	0.00
56	*Journal of Commercial Biotechnology*	1	0	0.00
57	*Journal of Organizational Change Management*	1	0	0.00
58	*Journal of Private Equity*	1	0	0.00
59	*Proceedings – 2020 IEEE International Conference on Engineering, Technology and Innovation, ICE/ITMC 2020*	1	0	0.00
60	*Proceedings of International Conference on Computers and Industrial Engineering*	1	0	0.00
61	*Proceedings of the 2017 IEEE European Technology and Engineering Management Summit*	1	0	0.00
62	*Proceedings of the International Astronautical Congress*	1	0	0.00
63	*Revista Del Ministerio De Empleo Y Seguridad Social*	1	0	0.00
64	*Sustainability (Switzerland)*	1	0	0.00

TC, total number of citations; TC/TP, average number of citations per paper; TP, total number of papers.

Table 4. All authors sorted by the TC value

Rank	Author	TP	TC	TC/TP	Rank	Author	TP	TC	TC/TP
1	Kohler T.	1	111	111.00	85	Hubert M.	1	2	2.00
2	Hochberg Y. V.	2	97	48.50	86	Káganer E.	1	2	2.00
3	Kanbach D. K.	4	38	9.50	87	Prexl K.-M.	1	2	2.00
4	Stubner S.	2	34	17.00	88	Prügl R.	1	2	2.00
5	Jackson P.	3	33	11.00	89	Glinik M.	2	2	1.00
6	Richter N.	3	33	11.00	90	Alonso D.	1	1	1.00
7	Cohen S.	1	29	29.00	91	Carvalho A. C.	1	1	1.00
8	Fehder D. C.	1	29	29.00	92	Castela G.	1	1	1.00
9	Murray F.	1	29	29.00	93	Childs P. R. N.	1	1	1.00
10	Shankar R. K.	1	25	25.00	94	Duréndez A.	1	1	1.00
11	Shepherd D. A.	1	25	25.00	95	Fernandes S.	1	1	1.00
12	Kim J. - H.	1	24	24.00	96	Garcia-Herrera C.	1	1	1.00
13	Wagman L.	1	24	24.00	97	García-Pérez-De-Lema D.	1	1	1.00
14	Schildhauer T.	2	19	9.50	98	Grilo A.	2	1	0.50
15	Gutmann T.	3	18	6.00	99	Iborra A.	1	1	1.00
16	Mangematin V.	1	18	18.00	100	Ismail A.	1	1	1.00
17	Stayton J.	1	18	18.00	101	Maas C.	1	1	1,.00
18	Borchers P.	1	17	17.00	102	Mariño-Garrido T.	1	1	1.00
19	Kupp M.	1	17	17.00	103	Pastor J. A.	1	1	1.00
20	Marval M.	1	17	17.00	104	Perkmann M.	1	1	1.00
21	Brown R.	1	16	16.00	105	Pina J.P.	1	1	1.00
22	Karlsson T.	1	16	16.00	106	Sanchez P.	1	1	1.00
23	Lee N.	1	16	16.00	107	Suarez T.	1	1	1.00
24	Lundqvist M.	1	16	16.00	108	Urbaniec M.	1	1	1.00
25	Mansoori Y.	1	16	16.00	109	Zutshi A.	2	1	0.50
26	Mawson S.	1	16	16.00	110	Żur A.	1	1	1.00
27	Peterson L.	1	16	16.00	111	Ainamo A.	1	0	0.00
28	Kurpjuweit S.	2	16	8.00	112	Ali N.	1	0	0.00
29	Wagner S. M.	2	16	8.00	113	Amornpetchkul T.	1	0	0.00
30	Corral De Zubielqui G.	1	14	14.00	114	D'eredita M.A.	1	0	0.00

(*Continued*)

Table 4. Continued

Rank	Author	TP	TC	TC/TP	Rank	Author	TP	TC	TC/TP
31	Jones J.	1	14	14.00	115	Azinheiro M.	1	0	0.00
32	Oppelaar L.	1	14	14.00	116	Baltes G.H.	1	0	0.00
33	Seet P. - S.	1	14	14.00	117	Boni A.A.	1	0	0.00
34	Fink A. A.	1	13	13.00	118	Branagan S.	1	0	0.00
35	Herstatt C.	1	13	13.00	119	Butz H.	1	0	0.00
36	Moschner S. - L.	1	13	13.00	120	Charoontham K.	1	0	0.00
37	Kher R.	1	12	12.00	121	Cwik T.	1	0	0.00
38	Lyons T. S.	1	12	12.00	122	Farelo R.M.	1	0	0.00
39	Yang S.	1	12	12.00	123	French R.	1	0	0.00
40	Luo J.	1	10	10.00	124	Gfrerer A.	1	0	0.00
41	Yin B.	1	10	10.00	125	Gillig H.	1	0	0.00
42	Bustamante C. V.	1	9	9.00	126	Gunn M.	1	0	0.00
43	Fuglsang L.	1	8	8.00	127	Gür U.	1	0	0.00
44	Wallin A. J.	1	8	8.00	128	Gębczyńska M.	1	0	0.00
45	Duvert C.	1	7	7.00	129	Ha K.S.	1	0	0.00
46	Esquirol M.	1	7	7.00	130	Harris W.L.	1	0	0.00
47	Katila R.	1	7	7.00	131	Heinz R.	1	0	0.00
48	Leatherbee M.	1	7	7.00	132	Heinzelmann N.	1	0	0.00
49	Mahmoud-Jouini S. B.	1	7	7.00	133	Hilton J.	1	0	0.00
50	Beleiu I. N.	1	6	6.00	134	Hutter K.	1	0	0.00
51	Bordean O. N.	1	6	6.00	135	Hwangbo Y.	1	0	0.00
52	Bunduchi R.	1	6	6.00	136	Jung S.	1	0	0.00
53	Connolly A. J.	1	6	6.00	137	Knight D.	1	0	0.00
54	Crișan E. L.	1	6	6.00	138	Kohlert H.	1	0	0.00
55	Potocki A. D.	1	6	6.00	139	Komarek R.	1	0	0.00
56	Salanță I. I.	1	6	6.00	140	Kotys-Schwartz D.A.	1	0	0.00
57	Turner J.	1	6	6.00	141	Kozlov M.	1	0	0.00
58	Carrilero-Castillo A.	1	4	4.00	142	Kunes M.	1	0	0.00
59	De La Vega M.	1	4	4,.00	143	Kwiotkowska A.	1	0	0.00
60	Gallego-Nicholls J. F.	1	4	4.00	144	Lindner B.	1	0	0.00
61	Guijarro-García M.	1	4	4.00	145	Poandl E.M.	1	0	0.00
62	Hilliger I.	1	4	4.00	146	Mikkelä K.	1	0	0.00
63	Hyrynsalmi S.	1	4	4.00	147	Moon I.	1	0	0.00
64	Ibert O.	1	4	4.00	148	Mrożewski M.J.	1	0	0.00
65	Järvi A.	1	4	4.00	149	Obłój K.	1	0	0.00
66	Kuebart A.	1	4	4.00	150	Oivo M.	1	0	0.00
67	Mendoza C. M.	1	4	4.00	151	Pielken S.	1	0	0.00
68	Mäkilä T.	1	4	4.00	152	Pikas E.	1	0	0.00
69	Pérez-Sanagustín M.	1	4	4.00	153	Pina J.P.	1	0	0.00
70	Seltman S.	1	4	4.00	154	Rasti-Barzoki M.	1	0	0.00
71	Bodrov K.	1	3	3.00	155	Selig C.J.	1	0	0.00
72	Haines J. K.	1	3	3.00	156	Seo W.S.	1	0	0.00
73	Ivashchenko M.	1	3	3.00	157	Sewall E.	1	0	0.00
74	Onetti A.	1	3	3.00	158	Shapiro A.	1	0	0.00
75	Ramiel H.	1	3	3.00	159	Shenkoya T.	1	0	0.00
76	Ruseva R.	1	3	3.00	160	Sota F.G.	1	0	0.00
77	Ruskov P.	1	3	3.00	161	Stephan Y.	1	0	0.00
78	Tolstoba N.	1	3	3.00	162	Tripathi N.	1	0	0.00
79	Cánovas-Saiz L.	3	2	0.67	163	Wierciński S.	1	0	0.00
80	March-Chordà I.	3	2	0.67	164	Wonglimpiyarat J.	1	0	0.00
81	Yagüe-Perales R. M.	3	2	0.67	165	Wójcik P.	1	0	0.00
82	Beck S.	1	2	2.00	166	Wąsowska A.	1	0	0.00
83	Carmel E.	1	2	2.00	167	Zarei H.	1	0	0.00
84	Heiden C.	1	2	2.00					

TC, total number of citations; TC/TP, average number of citations per paper; TP, total number of papers.

translates into 9.50 citations per article. T. Kohler is the author whose article has the highest number of citations: 111 [Kohler, 2016]. Most of the authors analyzed are male.

4.6 Research centers with the greatest productivity

On the whole, 110 research centers were involved in the creation of the 76 publications analyzed. More than half of the publications were published by representatives of one research institution. The following list provides the number of papers published by representatives of institutions:

- Two research institutions were involved in the creation of 26 publications;
- Three research institutions were involved in the creation of seven publications;
- Four research institutions were involved in the creation of three publications;
- Five research institutions were involved in the creation of two publications.

Most of the institutions analyzed are from Europe. Table 5 shows all research institutions that published articles on startup accelerators, along with the number of citations. The average citations per paper (TC/TP) were also calculated. Most papers (six) were written by researchers coming from *Handelshochschule Leipzig* – they were cited 40 times. This translates into 6.667 citations per article. The most frequently cited papers were published by representatives of *Universität Innsbruck* (two articles and 55.5 citations per article), Hawaii Pacific University (one article and 111 citations per article), and Rice University (one article and 68 citations per article) [Hochberg, 2016; Kohler, 2016].

4.7 Indicator-based analysis

In order to deepen their knowledge of the literature, the authors performed an indicator-based analysis to identify the most prominent authors, journals, and articles in the area of startup accelerators. The indicators take into account the work citation ratio, understood as a certain number of citations divided by a given number of publications and a certain number of publications above the citation threshold. The above analysis is based on the findings of Marczewska and Kostrzewski [2020]. It should be noted that, in this study, the authors made improvements in computational errors (e.g., the occurrence of division by zero). Modified formulas and explanations are provided below the relevant tables. This analysis is based on the i_j impact factor developed in Eqs. (1)–(5).

$$i_j = \frac{i_j^c}{i_j^p}; j \in J, J = \left\{ j : j = \overline{1,J} \right\} \tag{1}$$

$$i_j^c = \frac{c_j}{c_J^\Sigma} \tag{2}$$

$$i_j^p = \frac{p_j}{p_J^\Sigma} \tag{3}$$

$$c_J^\Sigma = \sum_1^J c_j; j \in J, J = \left\{ j : j = \overline{1,J} \right\} \tag{4}$$

$$p_J^\Sigma = \sum_1^J p_j; j \in J, J = \left\{ j : j = \overline{1,J} \right\} \tag{5}$$

where
J – collection of all sources analyzed;
i_j – impact factor of the analyzed research topic calculated for the j-th source;

Table 5. All research centers sorted by the TC value

Rank	Research centers	TP	TC	TC/TP	Rank	Research centers	TP	TC	TC/TP
1	*Universität Innsbruck*	2	111	55.5	56	Ben-Gurion University of the Negev	1	3	3
2	Hawaii Pacific University	1	111	111	57	*Universitat de València*	3	2	0.667
3	Massachusetts Institute of Technology (MIT)	3	78	26	58	*Universidad Politecnica de Cartagena*	2	2	1
4	Rice University	1	68	68	59	*Technische Universität Graz*	3	2	0.667
5	*Handelshochschule Leipzig*	6	40	6.667	60	American University	1	2	2
6	Edith Cowan University	4	40	10	61	IESE Business School	1	2	2
7	MIT and NBER	1	30	30	62	Kogod School of Business	1	2	2
8	MIT Sloan and NBER	1	30	30	63	*Universidade do Algarve*	1	2	2
9	University of Southern California	1	30	30	64	Imperial College Business School	1	1	1
10	University of Georgia	1	30	30	65	School of Business and Law	1	1	1
11	Alexander von Humboldt Institute for Internet and Society	3	26	8.667	66	HIIG	1	1	1
12	University of Colorado Boulder	1	24	24	67	Open Innovation in Science Center	1	1	1
13	Illinois Institute of Technology	1	24	24	68	Zeppelin University	1	1	1
14	Allianz	1	20	20	69	Copenhagen Business School	1	1	1
15	ESCP Europe Business School, Paris	1	20	20	70	*Aarhus Universitet*	1	1	1
16	Sonoma State University	1	18	18	71	NOFIMA	1	1	1
17	*Grenoble Ecole de Management*	1	18	18	72	Cracow University of Economics	1	1	1
18	Chalmers University of Technology	1	17	17	73	NOVA School of Science and Technology	2	1	0.5
19	London School of Economics and Political Science	1	16	16	74	*Universidade Nova de Lisboa*	2	1	0.5
20	University of St Andrews	1	16	16	75	*Universidade de Vigo*	1	1	1
21	University of Stirling	1	16	16	76	BluSpecs	1	1	1
22	School of Management	1	16	16	77	American University in Cairo	1	1	1
23	Community Living Australia	1	14	14	78	Seoul National University	1	1	1
24	The University of Adelaide	1	14	14	79	Isfahan University of Technology	1	1	1
25	Flinders University	1	14	14	80	Institute for Industrial Systems Innovation	1	1	1
26	The College of Business, Government and Law	1	14	14	81	WeXelerate GmbH	1	0	0
27	Dr. Ing. h.c. F. Porsche AG	1	13	13	82	Rocket Lab	1	0	0
28	University of Notre Dame	1	13	13	83	Jet Propulsion Laboratory	1	0	0
29	*Nord Universitet*	1	13	13	84	California Institute of Technology	1	0	0
30	City University of New York	1	13	13	85	Hochschule Konstanz University of Applied Sciences	1	0	0
31	Baruch College	1	13	13	86	*Uniwersytet Warszawski*	1	0	0
32	Michigan State University	1	13	13	87	Kozminski University	1	0	0
33	ETH Zürich	2	11	5.5	88	*Düzce Üniversitesi*	2	0	0
34	Singapore University of Technology and Design	1	10	10	89	*Universitat Salzburg*	1	0	0
35	*Roskilde Universitet*	1	9	9	90	Kookmin University	1	0	0

(*Continued*)

Table 5. Continued

Rank	Research centers	TP	TC	TC/TP	Rank	Research centers	TP	TC	TC/TP
36	VTT Technical Research Centre of Finland	1	9	9	91	Hoseo University	1	0	0
37	*Universidad Adolfo Ibáñez*	1	9	9	92	Strascheg Center for Entrepreneurship	1	0	0
38	*École des hautes études commerciales de Paris*	1	8	8	93	*Hochschule München*	1	0	0
39	Hamburg University of Technology	1	8	8	94	FERCHAU Engineering GmbH	1	0	0
40	Stanford University	1	7	7	95	*Universidad Europea de Madrid*	1	0	0
41	*Pontificia Universidad Católica de Chile*	1	7	7	96	BIC	1	0	0
42	*Universitatea Babeș-Bolyai*	1	6	6	97	Carnegie Mellon University	1	0	0
43	University of Rochester	1	6	6	98	University of San Francisco	1	0	0
44	The University of Edinburgh	1	6	6	99	Tepper School of Business	1	0	0
45	*Pontificia Universidad Católica de Chile*	1	5	5	100	Thailand National Institute of Development Administration	1	0	0
46	Alltech	1	4	4	101	Khon Kaen University	1	0	0
47	*Brandenburgische Technische Universität Cottbus*	1	4	4	102	Chungnam National University	1	0	0
48	Leibniz Institute for Research on Society and Space e.V.	1	4	4	103	Syracuse University	1	0	0
49	ESIC Business & Marketing School, Madrid	1	4	4	104	University of Colorado Boulder	1	0	0
50	Turun Yliopisto	1	4	4	105	*Tallinna Tehnikaülikool*	1	0	0
51	Sofia University St. Kliment Ohridski	1	3	3	106	Aalto University	1	0	0
52	*Università degli Studi dell'Insubria*	1	3	3	107	Technical University of Berlin	1	0	0
53	University of California	1	3	3	108	ESCP Europe Business School, Berlin	1	0	0
54	Saint Petersburg National Research University of Information Technologies, Mechanics and Optics University ITMO	1	3	3	109	Silesian University of Technology	1	0	0
55	ABB Group	1	3	3	110	University of Oulu	1	0	0

TC, total number of citations; TC/TP, average number of citations per paper; TP, total number of papers.

c_j – the number of citations for the analyzed research topic in the *j*-th source;
p_j – number of publications on the analyzed research topic in the *j*-th source;
c_J^{Σ} – total number of citations in the analyzed research topic in all *J* analyzed sources;
i_j^c – the ratio of the number of citations for the analyzed research topic in the *j*-th source to the total number of citations in all *J* analyzed sources;
p_J^{Σ} – total number of publications on the analyzed research topic in all *J* analyzed sources; and
i_j^p – the ratio of the number of publications on the analyzed research topic in the *j*-th source to the total number of publications in all *J* analyzed sources.

The presented impact factor for the startup accelerator topic was calculated for the *j*-th source and its basic parameters, including the number of citations and publications. All sources that published papers on startup accelerators are given in Table 6, along with calculations. In addition, value parameters that

Table 6. All sources in the research sorted by i_j

i_j Rank	Source title	c_j	p_j	i_j^c	i_j^p	i_j	SNIP$_i$	SJR$_i$	Scopus coverage years
1.	*Innovation Policy and the Economy*	68	1	0.121	0.013	9.163	2.485	0.895	2009, 2011–2020
2.	*Business Horizons*	125	2	0.222	0.026	8.422	2.942	2.174	1957–2020
3.	*Research Policy*	32	1	0.057	0.013	4.312	3.663	3.666	1971–2021
4.	*Journal of Business Venturing*	25	1	0.044	0.013	3.369	4.268	7.107	1985–2020
5.	*Journal of Corporate Finance*	24	1	0.043	0.013	3.234	2.665	1.894	1994–2020
6.	*Creativity and Innovation Management*	18	1	0.032	0.013	2.426	1.422	1.148	1992–2020
7.	*Technovation*	18	1	0.032	0.013	2.426	2.937	2.3	1981–2020
8.	*European Planning Studies*	17	1	0.030	0.013	2.291	1.743	1.214	1993–2020
9.	*Journal of Applied Business Research*	33	2	0.059	0.026	2.223	0.309	0.149	2005–2018
10.	*Asia Pacific Business Review*	14	1	0.025	0.013	1.887	0.746	0.424	1994–2020
11.	*Management Review Quarterly*	13	1	0.023	0.013	1.752	1.927	0.646	2014–2020
12.	*Journal of Technology Transfer*	24	2	0.043	0.026	1.617	2.462	1.768	1977–2020
13.	*Journal of Business Strategy*	21	2	0.037	0.026	1.415	1.02	0.495	1980–2020
14.	*Journal of Business Research*	9	1	0.016	0.013	1.213	2.852	2.049	1973–2021
15.	*Journal of Service Management*	9	1	0.016	0.013	1.213	2.537	2.658	2009–2020
16.	*International Journal of Innovation Management*	15	2	0.027	0.026	1.011	0.996	0.572	2008–2020
17.	*Entrepreneurship Research Journal*	14	2	0.025	0.026	0.943	0.84	0.395	2015–2020
18.	*Research Technology Management*	7	1	0.012	0.013	0.943	1.587	0.811	1988–1989, 1995–2020
19.	*Strategic Entrepreneurship Journal*	7	1	0.012	0.013	0.943	3.242	5.061	2011–2020
20.	*International Food and Agribusiness Management Review*	6	1	0.011	0.013	0.809	0.901	0.474	1998–2020
21.	*IEEE Transactions on Engineering Management*	10	2	0.018	0.026	0.674	1.255	0.702	1969–2020
22.	*CEUR Workshop Proceedings*	4	1	0.007	0.013	0.539	0.345	0.177	1989, 1994–1995, 1998, 2000–2020
23.	*International Journal of Intellectual Property Management*	4	1	0.007	0.013	0.539	0.695	0.464	2006–2014, 2020
24.	*Learning, Media and Technology*	4	1	0.007	0.013	0.539	2.154	1.355	2005–2020
25.	*Problems and Perspectives in Management*	4	1	0.007	0.013	0.539	0.793	0.23	2003–2020
26.	*Zeitschrift fur Wirtschaftsgeographie*	4	1	0.007	0.013	0.539	0.772	0.596	1978–1981, 1984, 1988–2020
27.	*California Management Review*	3	1	0.005	0.013	0.404	2.355	1.806	1970–2020
28.	*International Journal of Innovation and Learning*	3	1	0.005	0.013	0.404	0.628	0.225	2003, 2005–2014, 2018, 2020
29.	*Proceedings of SPIE – The International Society for Optical Engineering*	3	1	0.005	0.013	0.404	0.261	0.192	1963–2020
30.	*Proceedings of the ACM Conference on Computer Supported Cooperative Work, CSCW*	3	1	0.005	0.013	0.404	N/A	N/A	N/A

(*Continued*)

Table 6. Continued

i_j Rank	Source title	c_j	p_j	i_j^c	i_j^p	i_j	SNIP$_j$	SJR$_j$	Scopus coverage years
31.	*Proceedings of the European Conference on Innovation and Entrepreneurship, ECIE*	3	1	0.005	0.013	0.404	N/A	0.132	2015, 2019
32.	*ASEE Annual Conference and Exposition, Conference Proceedings*	5	2	0.009	0.026	0.337	N/A	0.219	2008, 2009, 2010, 2011, 2012, 2019
33.	*Journal of Business Economics*	2	1	0.004	0.013	0.270	1.595	0.737	1973–1979, 2013–2020
34.	*R and D Management*	2	1	0.004	0.013	0.270	1.53	1.253	1970–2020
35.	*International Journal of Engineering Pedagogy*	2	2	0.004	0.026	0.135	1.231	0.437	2018–2020
36.	*International Journal of Entrepreneurship and Innovation Management*	2	2	0.004	0.026	0.135	0.355	0.236	2001–2014, 2017, 2020
37.	*Entrepreneurial Innovation and Leadership: Preparing for a Digital Future*	1	1	0.002	0.013	0.135	N/A	N/A	N/A
38.	*Entrepreneurship and Regional Development*	1	1	0.002	0.013	0.135	1.942	1.673	1989–2020
39.	*European Journal of Management and Business Economics*	1	1	0.002	0.013	0.135	1.318	0.691	2016–2020
40.	*IEEE International Symposium on Industrial Electronics*	1	1	0.002	0.013	0.135	N/A	N/A	N/A
41.	*International Entrepreneurship and Management Journal*	1	1	0.002	0.013	0.135	2.309	1.338	2006–2020
42.	*Proceedings of International Design Conference, DESIGN*	1	1	0.002	0.013	0.135	N/A	0.206	2012, 2014
43.	*Proceedings of the International Conference on Industrial Engineering and Operations Management*	1	1	0.002	0.013	0.135	N/A	0.131	2016, 2017, 2018, 2019
44.	*Academic Entrepreneurship and Community Engagement: Scholarship in Action and the Syracuse Miracle*	0	1	0.000	0.013	0.000	N/A	N/A	N/A
45.	*Academy of Entrepreneurship Journal*	0	1	0.000	0.013	0.000	0.384	0.205	2009–2020
46.	*Advances in Intelligent Systems and Computing*	0	2	0.000	0.026	0.000	N/A	N/A	N/A
47.	*African Journal of Science, Technology, Innovation and Development*	0	1	0.000	0.013	0.000	0.582	0.225	2013–2020
48.	*Annals of DAAAM and Proceedings of the International DAAAM Symposium*	0	1	0.000	0.013	0.000	N/A	0.253	2005, 2006, 2007, 2008, 2009, 2010, 2011, 2015, 2018, 2019
49.	*Automotive Industries AI*	0	1	0.000	0.013	0.000	N/A	0.1	1970–1987, 1994–1997, 1999–2019
50.	*CIRIEC-Espana Revista de Economia Publica, Social y Cooperativa*	0	1	0.000	0.013	0.000	1.282	0.656	2015–2020

(*Continued*)

Table 6. Continued

i_j Rank	Source title	c_j	p_j	i_j^c	i_j^p	i_j	SNIP$_i$	SJR$_i$	Scopus coverage years
51.	*Economics of Innovation and New Technology*	0	1	0.000	0.013	0.000	1.398	0.797	1990–2020
52.	*FGF Studies in Small Business and Entrepreneurship*	0	2	0.000	0.026	0.000	N/A	N/A	N/A
53.	*Fundamentals of Software Startups: Essential Engineering and Business Aspects*	0	1	0.000	0.013	0.000	N/A	N/A	N/A
54.	*IEEE Aerospace Conference Proceedings*	0	1	0.000	0.013	0.000	0.725	0.359	1998, 2000–2019
55.	*IOP Conference Series: Materials Science and Engineering*	0	1	0.000	0.013	0.000	0.484	N/A	2009–2020
56.	*Journal of Commercial Biotechnology*	0	1	0.000	0.013	0.000	N/A	0.107	2003–2018
57.	*Journal of Organizational Change Management*	0	1	0.000	0.013	0.000	0.915	0.513	1988–2020
58.	*Journal of Private Equity*	0	1	0.000	0.013	0.000	0.136	0.129	2007–2019
59.	*Proceedings – 2020 IEEE International Conference on Engineering, Technology and Innovation, ICE/ITMC 2020*	0	1	0.000	0.013	0.000	N/A	N/A	N/A
60.	*Proceedings of International Conference on Computers and Industrial Engineering, CIE*	0	1	0.000	0.013	0.000	N/A	0.123	2012, 2013, 2017, 2018, 2019
61.	*Proceedings of the 2017 IEEE European Technology and Engineering Management Summit, E-TEMS 2017*	0	1	0.000	0.013	0.000	N/A	N/A	N/A
62.	*Proceedings of the International Astronautical Congress, IAC*	0	1	0.000	0.013	0.000	0.2	0.19	2012–2019
63.	*Revista del Ministerio de Empleo y Seguridad Social*	0	1	0.000	0.013	0.000	N/A	0.116	2017
64.	*Sustainability (Switzerland)*	0	1	0.000	0.013	0.000	1.242	0.612	N/A

c_j – the number of citations for the analyzed research topic in the j-th source; p_j – number of publications on the analyzed research topic in the j-th source; i_j^c – the ratio of the number of citations for the analyzed research topic in the j-th source to the total number of citations in all J analyzed sources; i_j^p – the ratio of the number of publications on the analyzed research topic in the j-th source to the total number of publications in all J analyzed sources; i_j – impact factor of the analyzed research topic calculated for the j-th source; SJR, SCImago journal rank; SNIP, source normalized impact per paper.

were not explicitly mentioned in Table 6 were used in the equations: namely, $c_J^{\Sigma} = 564$ citations and $p_J^{\Sigma} = 76$ publications.

In the next step, the authors checked whether there was a relationship between Source Normalized Impact per Paper (SNIP) and SCImago Journal Rank (SJR) and i_j. Pearson correlation was used in the study, and the results are presented in Table 7. Each case has a statistically significant correlation result, as evidenced by a p-value <0.05. This means that in this case of startup accelerator publications, all indicators are correlated on each other. The value of the correlation coefficient between i_j and SNIP is 0.5268. This is a strong correlation, meaning that the higher the value of i_j, the higher is the SNIP. The value of the correlation coefficient between i_j and SJR is 0.3486. This is a moderate correlation, meaning that the higher the value of i_j, the higher is the SJR. The value of the correlation coefficient between SNIP and SJR is 0.8693. This is a strong correlation, meaning that the higher the value of SNIP, the higher is the SJR.

Table 7. *R*-Pearson correlation results

	i_j	$\mathbf{SNIP}_j$	$\mathbf{SJR}_j$
i_j	1.0000 (*p*-value = –)		
$\mathbf{SNIP}_j$	0.5268 (*p*-value = 0.000)	1.0000 (*p*-value = –)	
$\mathbf{SJR}_j$	0.3486 (*p*-value = 0.019)	0.8693 (*p*-value = 0.000)	1.0000 (*p*-value = –)

i_j, impact factor of the analyzed research topic calculated for the *j*-th source; SJR, SCImago Journal Rank; SNIP, Source Normalized Impact per Paper.

Table 8 shows the most cited publications in the area of accelerators according to the Scopus database. All are articles published in journals after the year 2014. Comparing Table 1, which shows the publication dynamics, with Table 8, it can be concluded that the first publications about startup accelerators have very few or no citations [Carmel and Káganer, 2014; Richter et al., 2018b; Zarei et al., 2020].

Table 8 presents the most frequently cited articles on startup accelerators. This approach to area-specific publications is important but has serious limitations. The number of citations of a publication depends on many factors, and one of them is accessibility, that is, the period in which the publication is available. It is assumed that the longer a publication is available, the more citations it can get. Therefore, it is necessary to conduct an analysis that takes into account both of these factors. M. Marczewska and M. Kostrzewski [2020] have developed a weighted coefficient of the number of citations per year, as shown in Eq. (6). They proposed –1 year in the denominator. This is influenced by the fact that publications can be published at different times of the year and simultaneously be cited in the same year [Salwin et al., 2020]. This approach leads to a division by zero and limits the use of the indicator in a broad literature analysis, which was the case in this work. To make the formula usable for a broader analysis, we propose using +1 year in the denominator, as in Eq. (7). The extra year brings the length of time that the publication has been available to full years and eliminates the problem of dividing by zero in broad analyses such as that included in this article. Table 9 shows the calculations using Eqs. (6) and (7).

$$c_p^Y = \left| \frac{c_p}{(y_c - y_p - 1)} \right|; p \in P, P = \left\{ j : j = \overline{1,P} \right\} \tag{6}$$

$$c_p^Y = \left| \frac{c_p}{\left(y_c - y_p + 1\right)} \right|; p \in P, P = \left\{ j : j = \overline{1,P} \right\} \tag{7}$$

where

P – collection of all publications analyzed;

c_p^Y – weighted coefficient of the number of citations per year of the p-th publication;

c_p – total number of citations of the p-th publication;

y_c – year attribute equal to the current year according to the Gregorian calendar; and

y_p – year of p-th publication according to the Gregorian calendar

Table 8 shows the most cited articles, and Table 9 shows the ranking of publications sorted by c_p^Y, which was used to analyze all 76 publications. In both cases (citations and c_p^Y), the first 10 publications are the same papers.

Articles with the greatest impact focus on the following: corporate accelerators [Kohler, 2016; Richter et al., 2018b], seed accelerators [Kanbach and Stubner, 2016; Kupp et al., 2017; Shankar and Shepherd, 2019; Stayton and Mangematin, 2019], and general research on accelerator use in business [Kim and

Table 8. Most cited papers in startup accelerator research

Rank	Authors	Publication title	Source title	Reference	Number of citations	Year	Type of paper
1	Kohler T.	Corporate accelerators: Building bridges between corporations and startups	*Business Horizons*	Kohler [2016]	111	2016	Article
2	Hochberg Y.V.	Accelerating entrepreneurs and ecosystems: The seed accelerator model	*Innovation Policy and the Economy*	Hochberg [2016]	68	2016	Article
3	Kanbach D.K. and Stubner S.	Corporate accelerators as recent form of startup engagement: The what, the why, and the how	*Journal of Applied Business Research*	Kanbach and Stubner [2016]	33	2016	Article
4	Cohen S. et al.	The design of startup accelerators	*Research Policy*	Cohen et al. [2019]	30	2019	Article
5	Shankar R.K. and Shepherd D.A.	Accelerating strategic fit or venture emergence: Different paths adopted by corporate accelerators	*Journal of Business Venturing*	Shankar and Shepherd [2019]	25	2019	Article
6	Kim J.-H. and Wagman L.	Portfolio size and information disclosure: An analysis of startup accelerators	*Journal of Corporate Finance*	Kim and Wagman [2014]	24	2014	Article
7	Stayton J. and Mangematin V.	Seed accelerators and the speed of new venture creation	*Journal of Technology Transfer*	Stayton and Mangematin [2019]	18	2019	Article
8	Richter N. et al.	Outsourcing creativity: An abductive study of open innovation using corporate accelerators	*Creativity and Innovation Management*	Richter et al. [2018b]	18	2018	Article
9	Mansoori Y. et al.	The influence of the lean startup methodology on entrepreneur-coach relationships in the context of a startup accelerator	*Technovation*	Mansoori et al. [2019]	17	2019	Article
10	Kupp M. et al.	Corporate accelerators: fostering innovation while bringing together startups and large firms	*Journal of Business Strategy*	Kupp et al. [2017]	17	2017	Article

Wagman, 2014; Cohen et al., 2019] and accelerator use in universities [Mansoori et al., 2019]. However, each of these articles focuses on a different issue regarding startup acceleration. Focusing on c_p^Y only, it might be concluded that scientists are interested in further research in this area.

Table 9. All papers in the research sorted by c_p

c_p rank	Authors	Publication title	Source title	Reference	c_p	y_p	$c_p^Y(+1)$	$c_p^Y(-1)$	Type of paper
1	Kohler T.	Corporate accelerators: Building bridges between corporations and startups	*Business Horizons*	Kohler [2016]	112	2016	18.500	27.750	Article
2	Hochberg Y.V.	Accelerating entrepreneurs and ecosystems: The seed accelerator model	*Innovation Policy and the Economy*	Hochberg [2016]	68	2016	11.333	17.000	Article
3	Kanbach D.K. and Stubner S.	Corporate accelerators as recent form of startup engagement: The what, the why, and the how	*Journal of Applied Business Research*	Kanbach and Stubner [2016]	33	2016	5.500	8.250	Article
4	Cohen S. et al.	The design of startup accelerators	*Research Policy*	Cohen et al. [2019]	30	2019	10.000	30.000	Article
5	Shankar R.K. and Shepherd D.A.	Accelerating strategic fit or venture emergence: Different paths adopted by corporate accelerators	*Journal of Business Venturing*	Shankar and Shepherd [2019]	25	2019	8.333	25.000	Article
6	Kim J.-H. and Wagman L.	Portfolio size and information disclosure: An analysis of startup accelerators	*Journal of Corporate Finance*	Kim and Wagman [2014]	24	2014	3.000	4.000	Article
7	Stayton J. and Mangematin V.	Seed accelerators and the speed of new venture creation	*Journal of Technology Transfer*	Stayton and Mangematin [2019]	18	2019	6.000	18.000	Article
8	Richter N. et al.	Outsourcing creativity: An abductive study of open innovation using corporate accelerators	*Creativity and Innovation Management*	Richter et al. [2018b]	18	2018	4.500	9.000	Article
9	Mansoori Y. et al.	The influence of the lean startup methodology on entrepreneur-coach relationships in the context of a startup accelerator	*Technovation*	Mansoori et al. [2019]	17	2019	5.667	17.000	Article
10	Kupp M. et al.	Corporate accelerators: Fostering innovation while bringing together startups and large firms	*Journal of Business Strategy*	Kupp et al. [2017]	17	2017	3.400	5.667	Article
11	Brown R. et al.	Start-up factories, transnational entrepreneurs and entrepreneurial ecosystems: Unpacking the lure of start-up accelerator programmes	*European Planning Studies*	Brown et al. [2019]	16	2019	5.333	16.000	Article
12	Seet P.-S. et al.	Beyond "know-what" and "know-how" to "know-who": Enhancing human capital with social capital in an Australian start-up accelerator	*Asia Pacific Business Review*	Seet et al. [2018]	14	2018	3.500	7.000	Article
13	Jackson P. and Richter N.	Situational logic: An analysis of open innovation using corporate accelerators	*International Journal of Innovation Management*	Jackson and Richter [2017]	14	2017	2.800	4.667	Article
14	Gutmann T.	Harmonizing corporate venturing modes: An integrative review and research agenda	*Management Review Quarterly*	Gutmann [2019]	13	2019	4.333	13.000	Article
15	Moschner S.-L. et al.	Toward a better understanding of corporate accelerator models	*Business Horizons*	Moschner et al. [2019]	13	2019	4.333	13.000	Article

(*Continued*)

Table 9. Continued

c_p rank	Authors	Publication title	Source title	Reference	c_p	y_p	$c_p^Y(+1)$	$c_p^Y(-1)$	Type of paper
16	Yang S. et al.	Where do accelerators fit in the venture creation pipeline? Different values brought by different types of accelerators	*Entrepreneurship Research Journal*	Yang et al. [2018]	13	2018	3.250	6.500	Article
17	Yin B. and Luo J.	How do accelerators select startups? Shifting decision criteria across stages	*IEEE Transactions on Engineering Management*	Yin and Luo [2018]	10	2018	2.500	5.000	Article
18	Bustamante C.V.	Strategic choices: Accelerated startups' outsourcing decisions	*Journal of Business Research*	Bustamante [2019]	9	2019	3.000	9.000	Article
19	Wallin A.J. and Fuglsang L.	Service innovations breaking institutionalized rules of health care	*Journal of Service Management*	Wallin and Fuglsang [2017]	9	2017	1.800	3.000	Article
20	Leatherbee M. and Katila R.	The lean startup method: Early-stage teams and hypothesis-based probing of business ideas	*Strategic Entrepreneurship Journal*	Leatherbee and Katila [2020]	7	2020	3.500	Division by zero	Article
21	Mahmoud-Jouini S.B. et al.	Key factors in building a corporate accelerator capability: Developing an effective corporate accelerator requires close attention to the relationships between startups and the sponsoring company	*Research Technology Management*	Mahmoud-Jouini et al. [2018]	7	2018	1.750	3.500	Article
22	Crișan E.L. et al.	A systematic literature review on accelerators	*Journal of Technology Transfer*	Crișan et al. [2021]	6	2021	6.000	6.000	Article
23	Connolly A.J. et al.	IGNITE your corporate innovation: Insights from setting up an ag-tech start-up accelerator	*International Food and Agribusiness Management Review*	Connolly et al. [2018]	6	2018	1.500	3.000	Article
24	Hilliger I. et al.	Does the revision of ABET student outcomes include the competencies required to succeed in start-ups and entrepreneurial companies?	*ASEE Annual Conference and Exposition, Conference Proceedings*	Hilliger et al. [2017]	5	2017	1.000	1.667	Conference paper
25	Guijarro-García M. et al.	Speeding up ventures – a bibliometric analysis of start-up accelerators	*International Journal of Intellectual Property Management*	Guijarro-García et al., 2019]	4	2019	1.333	4.000	Article
26	Gutmann T. et al.	Exploring the benefits of corporate accelerators: Investigating the SAP Industry 4.0 Startup program	*Problems and Perspectives in Management*	Gutmann et al. [2019]	4	2019	1.333	4.000	Article
27	Kuebart A. and Ibert O.	Beyond territorial conceptions of entrepreneurial ecosystems: The dynamic spatiality of knowledge brokering in seed accelerators	*Zeitschrift für Wirtschaftsgeographie*	Kuebart and Ibert [2019]	4	2019	1.333	4.000	Article

(*Continued*)

Table 9. Continued

c_p rank	Authors	Publication title	Source title	Reference	c_p	y_p	$c_p^Y(+1)$	$c_p^Y(-1)$	Type of paper
28	Järvi A. et al..	Game development accelerator – Initial design and research approach	*CEUR Workshop Proceedings*	Järvi et al. [2013]	4	2013	0.444	0.571	Conference paper
29	Onetti A.	Turning open innovation into practice: Trends in European corporate	*Journal of Business Strategy*	Onetti [2021]	3	2021	3.000	3.000	Article
30	Ramiel H.	Edtech disruption logic and policy work: The case of an Israeli edtech unit	*Learning, Media and Technology*	Ramiel [2021]	3	2021	3.000	3.000	Article
31	Kurpjuweit S. and Wagner S.M.	Startup supplier programs: A new model for managing corporate-startup partnerships	*California Management Review*	Kurpjuweit and Wagner [2020]	3	2020	1.500	Division by zero	Article
32	Ivashchenko M. et al.	Educational area for learning of optics and technologies: Union of open laboratories of ideas, methods and practices (OLIMP)	*Proceedings of SPIE – The International Society for Optical Engineering*	Ivashchenko et al. [2016]	3	2016	0.500	0.750	Conference paper
33	Ruseva R. and Ruskov P.	The reverse business-modelling framework: A new approach towards action-oriented entrepreneurship	*Proceedings of the European Conference on Innovation and Entrepreneurship, ECIE*	Ruseva and Ruskov [2015]	3	2015	0.429	0.600	Conference paper
34	Haines J.K.	Emerging innovation: The global expansion of seed accelerators	*Proceedings of the ACM Conference on Computer Supported Cooperative Work, CSCW*	Haines [2014]	3	2014	0.375	0.500	Conference paper
35	Fernandes S. and Castela G.	Start-ups' accelerators support open innovation in Portugal	*International Journal of Innovation and Learning*	Fernandes and Castela [2019]	2	2019	0.667	2.000	Article
36	Glinik M.	Gruendungsgarage – A best-practice example of an academic start-up accelerator	*International Journal of Engineering Pedagogy*	Glinik [2019b]	2	2019	0.667	2.000	Article
37	Prexl K.-M. et al.	Identifying and analysing the drivers of heterogeneity among ecosystem builder accelerators	*R and D Management*	Prexl et al. [2019]	2	2019	0.667	2.000	Article
38	Carmel E. and Káganer E.	Ayudarum: an Austrian crowdsourcing company in the Startup Chile accelerator program	*Journal of Business Economics*	Carmel and Káganer [2014]	2	2014	0.250	0.333	Article
39	Canovas-Saiz L. et al.	A quantitative-based model to assess seed accelerators' performance	*Entrepreneurship and Regional Development*	Canovas-Saiz et al. [2021]	1	2021	1.000	1.000	Article
40	Urbaniec M. and Żur A.	Business model innovation in corporate entrepreneurship: exploratory insights from corporate accelerators	*International Entrepreneurship and Management Journal*	Urbaniec and Żur [2021]	1	2021	1.000	1.000	Article

(*Continued*)

Table 9. Continued

c_p rank	Authors	Publication title	Source title	Reference	c_p	y_p	$c_p^Y(+1)$	$c_p^Y(-1)$	Type of paper
41	Cánovas-Saiz L. et al.	New evidence on accelerator performance based on funding and location	*European Journal of Management and Business Economics*	Cánovas-Saiz et al. [2020]	1	2020	0.500	Division by zero	Article
42	Gutmann T. et al.	Startups in a corporate accelerator: What is satisfying, what is relevant and what can corporates improve?	*International Journal of Entrepreneurship and Innovation Management*	Gutmann et al. [2020]	1	2020	0.500	Division by zero	Article
43	Ismail A.	A framework for designing business-acceleration programs: A case study from Egypt	*Entrepreneurship Research Journal*	Ismail [2020]	1	2020	0.500	Division by zero	Article
44	Mariño-Garrido T. et al.	Assessment criteria for seed accelerators in entrepreneurial project selections	*International Journal of Entrepreneurship and Innovation Management*	Mariño-Garrido et al. [2020]	1	2020	0.500	Division by zero	Article
45	Garcia-Herrera C. et al.	Industry-led corporate start-up accelerator design: Lessons learned in a maritime port complex	*Proceedings of International Design Conference, DESIGN*	Garcia-Herrera et al. [2018]	1	2018	0.250	0.500	Conference paper
46	Richter N. et al.	Radical innovation using corporate accelerators: A program approach	*Entrepreneurial Innovation and Leadership: Preparing for a Digital Future*	Richter et al. [2018a]	1	2018	0.250	0.500	Book chapter
47	Carvalho A.C. et al.	How business startup accelerators envision their future	*Proceedings of the International Conference on Industrial Engineering and Operations Management*	Carvalho et al. [2017]	1	2017	0.200	0.333	Conference paper
48	Iborra A. et al.	Beyond traditional entrepreneurship education in engineering promoting IoT start-ups from universities	*IEEE International Symposium on Industrial Electronics*	Iborra et al. [2017]	1	2017	0.200	0.333	Conference paper
49	Ainamo A. et al.	University ecosystem for student startups: A "platform of trust" perspective	*Advances in Intelligent Systems and Computing*	Ainamo et al. [2021]	0	2021	0.000	0.000	Conference paper
50	Boni A.A. and Gunn M.	Introductory overview to special edition –"Building and Leveraging the Innovation Ecosystem and Clusters: Universities, Startups, Accelerators, Alliances, and Partnerships"	*Journal of Commercial Biotechnology*	Boni and Gunn [2021]	0	2021	0.000	0.000	Review

(*Continued*)

Table 9. Continued

c_p rank	Authors	Publication title	Source title	Reference	c_p	y_p	$c_p^Y(+1)$	$c_p^Y(-1)$	Type of paper
51	Butz H. and Mrożewski M.J.	The selection process and criteria of impact accelerators. An exploratory study	*Sustainability (Switzerland)*	Butz and Mrożewski [2021]	0	2021	0.000	0.000	Article
52	Charoontham K. and Amornpetchkul T.	Reputational impact on startup accelerator's information disclosure and performance	*Economics of Innovation and New Technology*	Charoontham and Amornpetchkul [2021]	0	2021	0.000	0.000	Article
53	Gür U.	Absorptive capacity approach to technology transfer at corporate accelerators: A systematic literature review	*FGF Studies in Small Business and Entrepreneurship*	Gür [2021]	0	2021	0.000	0.000	Book chapter
54	Hutter K. et al.	From popular to profitable: Incumbents' experiences and challenges with external corporate accelerators	*International Journal of Innovation Management*	Hutter et al. [2021]	0	2021	0.000	0.000	Article
55	Shenkoya T.	A study of startup accelerators in Silicon Valley and some implications for Nigeria	*African Journal of Science, Technology, Innovation and Development*	Shenkoya [2021]	0	2021	0.000	0.000	Article
56	Cwik T. et al..	Space Startup Accelerator Pilot	*IEEE Aerospace Conference Proceedings*	Cwik et al. [2020]	0	2020	0.000	Division by zero	Conference paper
57	Heinzelmann N. et al.	Critical actions of and synergies between corporate entrepreneurship programs	*Proceedings – 2020 IEEE International Conference on Engineering, Technology and Innovation, ICE/ITMC 2020*	Heinzelmann et al., [2020]	0	2020	0.000	Division by zero	Conference paper
58	Pielken S. and Kanbach D.K.	Corporate accelerators in family firms – a conceptual view on their design	*Journal of Applied Business Research*	Pielken and Kanbach, [2020]	0	2020	0.000	Division by zero	Article
59	Tripathi N. and Oivo M.	The roles of incubators, accelerators, co-working spaces, mentors, and events in the startup development process	*Fundamentals of Software Startups: Essential Engineering and Business Aspects*	Tripathi and Oivo [2020]	0	2020	0.000	Division by zero	Book chapter
60	Wójcik P. et al.	Corporate acceleration process: A systems psychodynamics perspective	*Journal of Organizational Change Management*	Wójcik et al. [2020]	0	2020	0.000	Division by zero	Article
61	Zarei H. et al.	A game theoretic approach to the selection, mentorship, and investment decisions of start-up accelerators	*IEEE Transactions on Engineering Management*	Zarei et al. [2020]	0	2020	0.000	Division by zero	Article

(*Continued*)

Table 9. Continued

c_p rank	Authors	Publication title	Source title	Reference	c_p	y_p	$c_p^Y(+1)$	$c_p^Y(-1)$	Type of paper
62	Glinik M.	Gruendungsgarage: A five-yearexperience at Graz University of Technology	*Advances in Intelligent Systems and Computing*	Glinik [2019a]	0	2019	0.000	0.000	Conference paper
63	Harris W.L. and Wonglimpiyarat J.	Start-up accelerators and crowdfunding to drive innovation development	*Journal of Private Equity*	Harris and Wonglimpiyarat [2019]	0	2019	0.000	0.000	Article
64	Kohlert H.	Innovations with incubation: Recommendations for corporate incubators and corporate accelerators – based on an empirical study	*Annals of DAAAM and Proceedings of the International DAAAM Symposium*	Kohlert [2019]	0	2019	0.000	0.000	Conference paper
65	Kunes M.	Astropreneurs: Space start-up accelerator	*Proceedings of the International Astronautical Congress, IAC*	Kunes [2019]	0	2019	0.000	0.000	Conference paper
66	Kwiotkowska A. and Gębczyńska M.	Accelerators for start-ups as the Strategic Initiative for the Development of Metropolis	*IOP Conference Series: Materials Science and Engineering*	Kwiotkowska [2019]	0	2019	0.000	0.000	Conference paper
67	Poandl E.M.	Towards digitalization in academic start-ups: An attempt to classify start-up projects of the Gruendungsgarage	*International Journal of Engineering Pedagogy*	Poandl [2019]	0	2019	0.000	0.000	Article
68	Jung S.	Cooperating with start-ups as a strategy: Towards corporate entrepreneurship and innovation	*FGF Studies in Small Business and Entrepreneurship*	Jung [2018]	0	2018	0.000	0.000	Book chapter
69	Saiz L.C. et al.	Social and economic impact of the Seed Accelerators: Significant factors and implications for the social innovation	*CIRIEC-Espana Revista de Economia Publica, Social y Cooperativa*	Saiz et al. [2018]	0	2018	0.000	0.000	Article
70	Azinheiro M. et al.	Digital marketing practices of start-up accelerators	*Proceedings of International Conference on Computers and Industrial Engineering, CIE*	Azinheiro et al. [2017]	0	2017	0.000	0.000	Conference paper

(*Continued*)

Table 9. Continued

c_p rank	Authors	Publication title	Source title	Reference	c_p	y_p	$c_p^Y(+1)$	$c_p^Y(-1)$	Type of paper
71	Heinz R. et al.	Scouting of early-stage start-ups: Development and initial test of a conceptual framework	*Proceedings of the 2017 IEEE European Technology and Engineering Management Summit, E-TEMS 2017*	Heinz et al. [2017]	0	2017	0.000	0.000	Conference paper
72	Sota F.G. and Farelo R.M.	From labour flexibility to mobile identity: The «Startup» model within the framework of Spanish entrepreneurship	*Revista del Ministerio de Empleo y Seguridad Social*	Sota and Farelo [2017]	0	2017	0.000	0.000	Article
73	Komarek R. et al.	Assessment of a cross-disciplinary university startup accelerator	*ASEE Annual Conference and Exposition, Conference Proceedings*	Komarek et al. [2016]	0	2016	0.000	0.000	Conference paper
74	Seo W.S. et al.	The current status and improvement strategy of the Korean start-up accelerators	*Academy of Entrepreneurship Journal*	Seo et al. [2014]	0	2014	0.000	0.000	Article
75	Hilton J.	Volkswagen Group of America launches technology startup accelerator at plug and play tech center: Innovation accelerator seeking 10 startups to help develop next generation of vehicle technology	*Automotive Industries AI*	Hilton [2012]	0	2012	0.000	0.000	Article
76	D'Eredita M.A. et al..	Tapping our fountain of youth: The guiding philosophy and first report on the Syracuse student startup accelerator	*Academic Entrepreneurship and Community Engagement: Scholarship in Action and the Syracuse Miracle*	D'Eredita et al. [2011]	0	2011	0.000	0.000	Book chapter

IoT, Internet of Things.

5 Conclusions

This article responds to the expectations raised by academics, young entrepreneurs, and business practitioners regarding the need to bring together in one place systematized research on startup accelerators that has so far been scattered. This will help theorists, practitioners, and researchers to effectively reach out to the issues of interest. Corporate executives can take a retrospective look at their operations and learn about cooperation programs and models used in different countries. The article presents the state of the art of the above-mentioned business environment institutions along with systematized knowledge in this area. The paper is a review of the literature available in the Scopus database between 2011 and 2021. The presented classification is based on the current state of knowledge and indicates different directions of development of startup accelerators. The conclusions of this research indicate that there is no single proven model of accelerator operation leading to success, and the support offered to startups varies and requires an individual approach.

The study demonstrates that this area is still developing and there is an apparent need for further work directly in the market and among academic units to understand the role of accelerators as key elements for the development of entrepreneurship. However, accelerator activity is a relatively new model of support for startups, combining many features that – in the past – were usually provided separately. The models of accelerators' market operations differ from those previously known, such as the operations of science and technology parks or coworking spaces. The article outlines what added value is offered by accelerators in their programs for young innovative companies. Differences in performance are important for the ultimate success of startup products and the evaluation of the support offered. This support, consisting – for example – in access to capital, space, contacts, communication about conducted activities, work on product development, or tests at a potential technology recipient's premises, is an attractive incentive for startups to participate in acceleration programs.

The topic of cooperation between accelerators and startups is becoming increasingly popular every year. The number of publications devoted to it is gradually increasing. The first publication on startup accelerators appeared in the Scopus database in 2011, with only one article published in 2012 and 2013. The following years brought an increase in the number of publications available in the above-mentioned database. In 2020, there was an apparent decrease in the number of publications on this topic, most likely due to the COVID-19 pandemic. In 2021 (as of the end of July), 12 new publications in this field have been identified. The largest group of accelerator researchers originated from the United States, with 19 articles that were cited 322 times. The next most frequent researchers are scientists from Germany, who wrote 15 articles cited 120 times. The following most represented countries are Sweden, France, Norway, Austria, and Singapore. It is worth noting that the highest number of publications comes from countries with strong and innovative economies that invest in the development of modern technologies. Furthermore, it is important to recognize the interdisciplinary nature of the sources studied, which often cover more than one research area, for example, business, management, accounting, technical studies, economics, social sciences, informatics, decision theory, environmental sciences, materials research, medicine, and energy. Therefore, although startup accelerators have not enjoyed many indexed publications in the Scopus database as a research topic, they have certainly seen an increase in interest from researchers from various disciplines and represent a great potential for research and publication.

The analyzed publications were written by 167 authors. The vast majority of these are multiauthored works; moreover, 110 research centers were involved in the creation of the publications. The papers were released by 64 publishers and cited 564 times. The highest ranking was given to *Business Horizons* (a journal with a CiteScore of 11.3 and Journal Impact Factor (JIF) of 6.361).

Analyses showed that corporate accelerators were the most frequently selected research topic in articles. Accelerator programs that enable large companies and corporations to access innovations to increase product competitiveness or process productivity by engaging in collaboration with startups were studied. In total, the topic of corporate accelerators was included in as many as 27 out of 76 research papers analyzed. Other large groups of publications focused on the areas of seed accelerators and academic accelerators.

For startups, this article will be helpful in better matching the developed project with existing accelerator programs on the market. It can contribute to a better understanding of the principles governing the programs, the selection criteria used, as well as the program expectations of the accelerator and its partners with respect to the proposed solutions (corporations, business angels, and venture capital funds).

The limitation of the analysis performed by the authors was that the study was based on publications written in English, indexed only in the Scopus database. Due to the novelty of the research topic undertaken, the numbers of articles and their citations are not very high. This includes the number of authors and research units conducting research in the field, the countries from which they come, and the publications. Despite the small number of publications, the authors believe that conducting this analysis was necessary to draw attention to this little-known research area. It is likely that more material can be found in sources that are not indexed.

The authors' future research will focus on the analysis of the Web of Science scientific database. This is intended to deepen the analysis of the literature in the area of startup accelerator operations. In addition, future work will focus on the study of corporations and startups to compile the factors that determine the establishment of cooperation and to develop a model for the success of ongoing ventures.

Author Contributions

Conceptualization: MB and MS; methodology: MB and MS; formal analysis: MB, MS, and SR; investigation: MB, MS, and SR; resources: MB, MS, and SR; data curation: MB, MS, and SR; writing—original draft preparation: MB, MS, and MK; writing—review and editing: MB, MS, MK, and AEW; visualization: MB, MS, SR, MK, and AEW; supervision: MB and MS; project administration: MB, MS, MK, and AEW; funding acquisition: MB, MS, MK, and AEW. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

References

Aernoudt, R. (2004), Incubators: Tool for Entrepreneurship? Small Business Economics, Vol. 23, pp. 127–135, doi: 10.1023/B:SBEJ.0000027665.54173.23.

Aghion, P., Hemous, D., Veugelers, R. (2009), No green growth without innovation, Bruegel, Policy Brief.

Ainamo, A., Pikas, E., Mikkelä, K. (2021), University Ecosystem for Student Startups: A 'Platform of Trust' Perspective; in: 23rd International Conference on Interactive Collaborative Learning, ICL 2020; Springer Science and Business Media Deutschland GmbH, Vol. 1329; ISBN 21945357 (ISSN); 9783030682002 (ISBN).

Azinheiro, M., Zutshi, A., Grilo, A., Pina, J. (2017), Digital marketing practices of start-up accelerators, in: M. Dessouky, A. Grilo, V. Cruz-Machado (Eds.), Proceedings of the Proceedings of International Conference on Computers and Industrial Engineering, CIE, Curran Associates Inc., Red Hook, NY.

Barbero, J.L., Casillas, J.C., Ramos, A., Guitar, S. (2012), Revisiting incubation performance. Technological Forecasting and Social Change, Vol. 79, pp. 888–902, doi: 10.1016/j.techfore.2011.12.003.

Bodner, M., Penga, Ž., Ladreiter, W., Heidinger, M., Hacker, V. (2021), Simulation-assisted determination of the start-up time of a polymer electrolyte fuel cell. Energies, Vol. 14, p. 7929, doi: 10.3390/en14237929.

Boni, A.A., Gunn, M. (2021), Introductory Overview to Special Edition –"Building and Leveraging the Innovation Ecosystem and Clusters: Universities, Startups, Accelerators, Alliances, and Partnerships." Journal of Commercial Biotechnology, Vol. 26, pp. 13–20, doi: 10.5912/jcb963.

Brown, R., Mawson, S., Lee, N., Peterson, L. (2019), Start-up factories, transnational entrepreneurs and entrepreneurial ecosystems: unpacking the lure of start-up accelerator programmes. European Planning Studies, Vol. 27, pp. 885–904, doi: 10.1080/09654313.2019.1588858.

Bustamante, C.V. (2019), Strategic choices: Accelerated startups' outsourcing decisions. Journal of Business Research, Vol. 105, pp. 359–369, doi: 10.1016/j.jbusres.2018.06.009.

Butz, H., Mrożewski, M.J. (2021), The selection process and criteria of impact accelerators. An exploratory study. Sustainability, Vol. 13, p. 6617, doi: 10.3390/su13126617.

Caccamo, M., Beckman, S. (2021), Leveraging accelerator spaces to foster knowledge communities. Technovation, p. 102421, doi: 10.1016/j.technovation.2021.102421.

Canovas-Saiz, L., March-Chordà, I., Yagüe-Perales, R.M. (2021), A quantitative-based model to assess seed accelerators' performance. Entrepreneurship and Regional Development, Vol. 33, pp. 332–352, doi: 10.1080/08985626.2021.1872941.

Cánovas-Saiz, L., March-Chordà, I., Yagüe-Perales, R.M. (2020), New evidence on accelerator performance based on funding and location. The European Journal of Management and Business Economics, Vol. 29, pp. 217–234, doi: 10.1108/EJMBE-10-2017-0029.

Carmel, E., Káganer, E. (2014), Ayudarum: An Austrian crowdsourcing company in the Startup Chile accelerator program, The Journal of Business Economics, Vol. 84, pp. 469–478, doi: 10.1007/s11573-014-0715-7.

Carvalho, A.C., Grilo, A., Pina, J.P., Zutshi, A. (2017), How business startup accelerators envision their future, in: Proceedings of the International Conference on Industrial Engineering and Operations Management, IEOM Society, pp. 503–514.

Casanova L., Cornelius P.K., Dutta S. (2017), Financing Entrepreneurship and Innovation in Emerging Markets, Elsevier, ISBN 978-0-12-804025-6.

Charoontham, K., Amornpetchkul, T. (2021), Reputational impact on startup accelerator's information disclosure and performance. Economics of Innovation and New Technology, doi: 10.1080/10438599.2021.1910030.

Cohen, S., Fehder, D.C., Hochberg, Y.V., Murray, F. (2019), The design of startup accelerators, Research Policy, Vol. 48, pp. 1781–1797, doi: 10.1016/j.respol.2019.04.003.

Connolly, A.J., Turner, J., Potocki, A.D. (2018), IGNITE your corporate innovation: Insights from setting up an ag-tech start-up accelerator. International Food and Agribusiness Management Review, Vol. 21, pp. 833–846, doi: 10.22434/IFAMR2017.0089.

Crișan, E.L., Salanță, I.I., Beleiu, I.N., Bordean, O.N., Bunduchi, R. (2021), A systematic literature review on accelerators. The Journal of Technology Transfer, Vol. 46, pp. 62–89, doi: 10.1007/s10961-019-09754-9.

Cwik, T., Kozlov, M., French, R., Shapiro, A., Sewall, E. (2020), Space Startup Accelerator Pilot, in: Proceedings of the IEEE Aerospace Conference Proceedings, IEEE Computer Society, p. 9172733.

D'Eredita, M.A., Branagan, S., Ali, N. (2011), Tapping our fountain of youth: The guiding philosophy and first report on the Syracuse Student Startup Accelerator, in: Academic Entrepreneurship and Community Engagement Scholarship in Action and the Syracuse Miracle, Edward Elgar Publishing Ltd., pp. 30–44 ISBN 9781849801553.

Drover, W., Busenitz, L., Matusik, S., Townsend, D., Anglin, A., Dushnitsky, G. (2017), A Review and Road Map of Entrepreneurial Equity Financing Research: Venture Capital, Corporate Venture Capital, Angel Investment, Crowdfunding, and Accelerators, Journal of Management, Vol. 43, pp. 1820–1853, doi: 10.1177/0149206317690584.

Enkel, E., Sagmeister, V. (2020), External corporate venturing modes as new way to develop dynamic capabilities, Technovation, Vol. 96–97, p. 102128, doi: 10.1016/j.technovation.2020.102128.

Fernandes, S., Castela, G. (2019), Start-ups' accelerators support open innovation in Portugal, International Journal of Innovation and Learning, Vol. 26, pp. 82–93, doi: 10.1504/IJIL.2019.100522.

Guijarro-García, M., Carrilero-Castillo, A., Gallego-Nicholls, J.F. (2019), Speeding up ventures – A bibliometric analysis of start-up accelerators, International Journal of Intellectual Property Management, Vol. 9, pp. 230-246, doi: 10.1504/IJIPM.2019.103027.

Garcia-Herrera, C., Perkmann, M., Childs, P.R.N. (2018), Industry-led corporate start-up accelerator design: Lessons learned in a maritime port complex, in: D. Marjanovic, M. Storga, N. Bojcetic, N. Pavkovic, S. Skec, (Eds), Proceedings of the International Design Conference, DESIGN; Faculty of Mechanical Engineering and Naval Architecture, Vol. 4, pp. 1845–1856.

Glinik, M. (2019b), Gruendungsgarage – A Best-Practice Example of an Academic Start-up Accelerator. International Journal of Engineering Pedagogy, Vol. 9, pp. 33–43, doi: 10.3991/ijep.v9i3.9876.

Glinik, M. (2019a), Gruendungsgarage: A five-year-experience at Graz University of Technology, in: 21st International Conference on Interactive Collaborative Learning, ICL 2018, Springer Verlag, Vol. 917; ISBN 21945357 (ISSN); 9783030119348 (ISBN).

Gür, U. (2021), Absorptive capacity approach to technology transfer at corporate accelerators: A systematic literature review, in: D. Mietzner, C. Schultz, (Eds.), New perspectives in technology transfer, FGF Studies in Small Business and Entrepreneurship, Springer International Publishing, Cham, pp. 51–69, ISBN 978-3-030-61476-8.

Gutmann, T. (2019), Harmonizing corporate venturing modes: an integrative review and research agenda. Management Review Quarterly, Vol. 69, pp. 121–157, doi: 10.1007/s11301-018-0148-4.

Gutmann, T., Kanbach, D., Seltman, S. (2019), Exploring the benefits of corporate accelerators: Investigating the SAP industry 4.0 Startup program, Problems and Perspectives in Management, Vol. 17, pp. 218–232, doi: 10.21511/ppm.17(3).2019.18.

Gutmann, T., Maas, C., Kanbach, D., Stubner, S. (2020), Startups in a corporate accelerator: what is satisfying, what is relevant and what can corporates improve? International Journal of Entrepreneurship and Innovation Management, Vol. 24, pp. 443–464, doi: 10.1504/IJEIM.2020.110098.

Haines, J.K. (2014), Emerging Innovation: The Global Expansion of Seed Accelerators, in: Proceedings of the ACM Conference on Computer Supported Cooperative Work CSCW, Association for Computing Machinery, Baltimore, MD, pp. 57–60.

Harris, W.L., Wonglimpiyarat, J. (2019), Start-Up Accelerators and Crowdfunding to Drive Innovation Development, The Journal of Private Equity, Vol. 23, pp, 124–136, doi: 10.3905/jpe.2019.1.091.

Heinz, R., Stephan, Y., Gillig, H. (2017), Scouting of Eearly-Stage Start-Ups: Development and initial test of a conceptual framework, in: T. Holzmann, C. Weber, R. Bierwolf, (Eds.), Proceedings of the IEEE European Technology and Engineering Management Summit, E-TEMS, Institute of Electrical and Electronics Engineers Inc., Vol. 2017-January, pp. 1–4.

Heinzelmann, N., Selig, C.J., Baltes, G.H. (2020). Critical Actions of and Synergies between Corporate Entrepreneurship Programs, in: Proceedings of the IEEE International Conference on Engineering and Technology Innovation, ICE/ITMC, Institute of Electrical and Electronics Engineers Inc., Piscataway, NJ.

Hilliger, I., Mendoza, C.M., Pérez-Sanagustín, M., De La Vega, M. (2017), Does the revision of ABET student outcomes include the competencies required to succeed in start-ups and entrepreneurial companies? in: Proceedings of the ASEE Annual Conference and Exposition Conference Proceedings, American Society for Engineering Education, Washington D.C., Vol. 2017-June.

Hilton, J. (2012), Volkswagen group of America launches technology startup accelerator at plug and play tech center: Innovation accelerator seeking 10 startups to help develop next generation of vehicle technology, Automotive Industries, Vol. 192, pp. 1–2, ISBN 10994130 (ISSN).

Hochberg, Y.V. (2016), Accelerating entrepreneurs and ecosystems: The seed accelerator model; Innovation Policy and the Economy, University of Chicago Press, Vol. 16, pp. 25–51, ISBN 15313468 (ISSN).

Hutter, K., Gfrerer, A., Lindner, B. (2021), From popular to profitable: Incumbents' experiences and challenges with external corporate accelerators. International Journal of Innovation Management, Vol. 25, p. 2150035, doi: 10.1142/S1363919621500353.

Iborra, A., Sanchez, P., Pastor, J.A., Alonso, D., Suarez, T. (2017), Beyond Traditional Entrepreneurship Education in Engineering Promoting IoT start-ups from universities, In: Proceedings of the IEEE International Symposium on Industrial Electronics, Institute of Electrical and Electronics Engineers Inc., Piscataway, NJ, pp. 1575–1580.

Ismail, A. (2020), A Framework for Designing Business-Acceleration Programs: A Case Study from Egypt. Entrepreneurship Research Journal, Vol. 10, p. 20180196, doi: 10.1515/erj-2018-0196.

Ivashchenko, M., Bodrov, K., Tolstoba, N. (2016), Educational area for learning of optics and technologies: Union of open laboratories of ideas, Methods and Practices (OLIMP), in: G.G. Gregory (Ed.), Proceedings of the SPIE International Society Optical Engineering, SPIE, Bellingham, WA, Vol. 9946.

Jackson, P., Richter, N. (2017), Situational logic: an analysis of open innovation using corporate accelerators, International Journal of Innovation Management, Vol. 21, p. 1750062, doi: 10.1142/S1363919617500621.

Järvi, A., Mäkilä, T., Hyrynsalmi, S. (2013), Game Development Accelerator – Initial Design and Research Approach, in: A. Herrmann, T. Makila, K. Wnuk, M. Daneva, S. Hyrynsalmi, (Eds), Proceedings of the CEUR Workshop, CEUR-WS, Vol. 1095, pp. 47–58.

Jung, S. (2018), Cooperating with start-ups as a strategy: Towards corporate entrepreneurship and innovation, in: Cooperating with start-ups as a strategy: Towards corporate entrepreneurship and innovation; FGF Studies in Small Business and Entrepreneurship, Springer, Vienna, Austria, pp. 283–298, ISBN 23646918 (ISSN).

Kanbach, D.K., Stubner, S. (2016), Corporate accelerators as recent form of startup engagement: the what, the why, and the how, Journal of Applied Business Research, Vol. 32, pp. 1761–1776, doi: 10.19030/jabr.v32i6.9822.

Kim, J.-H., Wagman, L. (2014), Portfolio size and information disclosure: An analysis of startup accelerators, Journal of Corporate Finance, Vol. 29, pp. 520–534, doi: 10.1016/j.jcorpfin.2014.10.017.

Kohler, T. (2016), Corporate accelerators: Building bridges between corporations and startups, Business Horizons, Vol. 59, pp. 347–357, doi: 10.1016/j.bushor.2016.01.008.

Kohlert, H. (2019), Innovations with Incubation: Recommendations for Corporate Incubators and Corporate Accelerators – Based on an Empirical Study, in: B. Katalinic, (Ed.), Proceedings of the 30th DAAAM International Symposium, Danube Adria Association for Automation and Manufacturing, DAAAM International, Vienna, Vol. 30, pp. 733–737.

Komarek, R., Knight, D., Kotys-Schwartz, D.A. (2016), Assessment of a cross-disciplinary university startup accelerator, in: ASEE Annual Conference and Exposition, Conference Proceedings, American Society for Engineering Education, Washington D.C., Vol. 2016-June.

Kuebart, A., Ibert, O. (2019). Beyond territorial conceptions of entrepreneurial ecosystems: The dynamic spatiality of knowledge brokering in seed accelerators. Zeitschrift für Wirtschaftsgeographie, Vol. 63, pp. 118–133, doi:10.1515/zfw-2018-0012.

Kukurba, M., Waszkiewicz, A.E., Salwin, M., Kraslawski, A. (2021). Co-created values in crowdfunding for sustainable development of enterprises, Sustainability, Vol. 13, p. 8767, doi: 10.3390/su13168767.

Kunes, M. (2019), Astropreneurs: Space start-up accelerator, in: Proceedings of the International Astronautical Congress, IAC, International Astronautical Federation, IAF, Paris, Vol. 2019-October.

Kupp, M., Marval, M., Borchers, P. (2017), Corporate accelerators: fostering innovation while bringing together startups and large firms, Journal of Business Strategy, Vol. 38, pp. 47–53, doi: 10.1108/JBS-12-2016-0145.

Kurpjuweit, S., Wagner, S.M. (2020), Startup supplier programs: a new model for managing corporate-startup partnerships, California Management Review, Vol. 62, pp. 64–85, doi: 10.1177/0008125620914995.

Kwiotkowska, A., Gębczyńska, M. (2019), Accelerators for start-ups as the strategic initiative for the development of metropolis, in: M. Decky, M. Marschalko, A.-M. Dabija E. Coisson, M. Drusa, J. Rybak, A. Segalini, I. Yilmaz, (Eds), Proceedings of the IOP Conference Series: Materials Science and Engineering, Institute of Physics Publishing, London, Vol. 471, p. 092014.

Laspia, A., Sansone, G., Landoni, P., Racanelli, D., Bartezzaghi, E. (2021), The organization of innovation services in science and technology parks: Evidence from a multi-case study analysis in Europe, Technological Forecasting and Social Change, Vol. 173, p. 121095, doi: 10.1016/j.techfore.2021.121095.

Leatherbee, M., Katila, R. (2020), The lean startup method: Early-stage teams and hypothesis-based probing of business ideas, Strategic Entrepreneurship Journal, Vol. 14, pp. 570–593, doi: 10.1002/sej.1373.

Lipiak, J., Salwin, M. (2021), Improvement of the warehouse functioning: A study based on an enterprise in the printing industry, in: V. Tonkonogyi, V. Ivanov, J. Trojanowska, G. Oborskyi, A. Grabchenko, I. Pavlenko, M. Edl, I. Kuric, P. Dasic, (Eds.), Advanced Manufacturing Processes II, Lecture Notes in Mechanical Engineering, Springer International Publishing, Cham, pp. 61–71. ISBN 978-3-030-68013-8.

Lipiak, J., Salwin, M. (2019), The Improvement of Sustainability with Reference to the Printing Industry – Case Study, in: A. Hamrol, M. Grabowska, D. Maletic, R. Woll, (Eds), Advances in Manufacturing II, Springer International Publishing, Cham, Vol. 3, pp. 254–266, ISBN 978-3-030-17268-8.

Mahmoud-Jouini, S.B., Duvert, C., Esquirol, M. (2018), Key Factors in Building a Corporate Accelerator Capability: Developing an effective corporate accelerator requires close attention to the relationships between startups and the sponsoring company, Research-Technology Management, Vol. 61, pp. 26–34, doi: 10.1080/08956308.2018.1471274.

Mansoori, Y., Karlsson, T., Lundqvist, M. (2019), The influence of the lean startup methodology on entrepreneur-coach relationships in the context of a startup accelerator, Technovation, Vol. 84–85, pp. 37–47, doi: 10.1016/j.technovation.2019.03.001.

Marczewska, M., Kostrzewski, M. (2020), Sustainable business models: A bibliometric performance analysis, Energies, Vol. 13, p. 6062, doi: 10.3390/en13226062.

Mariño-Garrido, T., García-Pérez-de-Lema, D., Duréndez, A. (2020), Assessment criteria for seed accelerators in entrepreneurial project selections, International Journal of Entrepreneurship and Innovation Management, Vol. 24, pp. 53–72, doi: 10.1504/IJEIM.2020.105276.

Moschner, S.-L., Fink, A.A., Kurpjuweit, S., Wagner, S.M., Herstatt, C. (2019), Toward a better understanding of corporate accelerator models, Business Horizons, Vol. 62, pp. 637–647, doi: 10.1016/j.bushor.2019.05.006.

Onetti, A. (2021), Turning open innovation into practice: trends in European corporates, Journal of Business Strategy, Vol. 42, pp. 51–58, doi: 10.1108/JBS-07-2019-0138.

Osterwalder, A., Pigneur, Y. (2002), An e-Business Model Ontology for Modeling e-Business, in: Proceedings of the BLED 2002, 2, Bled, Slovenia, June 17 2002, pp. 75–91.

Osterwalder, A., Pigneur, Y., Clark, T. (2010), Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Wiley, Hoboken, NJ, ISBN 978-0-470-87641-1.

Pauwels, C., Clarysse, B., Wright, M., Van Hove, J. (2016), Understanding a new generation incubation model: The accelerator, Technovation, Vol. 50–51, pp. 13–24, doi: 10.1016/j.technovation.2015.09.003.

Pielken, S., Kanbach, D.K. (2020), Corporate accelerators in family firms – a conceptual view on their design, Journal of Applied Business Research, Vol. 36, pp. 241–258.

Poandl, E.M. (2019), Towards digitalization in academic start-ups: an attempt to classify start-up projects of the gruendungsgarage, International Journal of Engineering Pedagogy, Vol. 9, pp. 112–119, doi: 10.3991/ijep.v9i3.9885.

Prexl, K.-M., Hubert, M., Beck, S., Heiden, C., Prügl, R. (2019), Identifying and Analysing the Drivers of Heterogeneity among Ecosystem Builder Accelerators, R & D Management, Vol. 49, pp. 624–638, doi: 10.1111/radm.12352.

Ramiel, H. (2021), Edtech disruption logic and policy work: the case of an Israeli edtech unit, Learning, Media and Technology, Vol. 46, pp. 20–32, doi: 10.1080/17439884.2020.1737110.

Richter, N., Jackson, P., Schildhauer, T. (2018b), Outsourcing creativity: An abductive study of open innovation using corporate accelerators, Creativity and Innovation Management, Vol. 27, pp. 69–78, doi: 10.1111/caim.12252.

Richter, N., Jackson, P., Schildhauer, T. (2018a), Radical innovation using corporate accelerators: A program approach, in: Entrepreneurial Innovation and Leadership: Preparing for a Digital Future, Springer International Publishing, Cham, pp. 99–108 ISBN 9783319717371.

Ruseva, R., Ruskov, P. (2015), The reverse business-modelling framework: A new approach towards action-oriented entrepreneurship, in: R.P. Dameri, M. Resta, R. Garelli, (Eds), Proceedings of the European Conference on Innovation and Entrepreneurship, ECIE, Academic Conferences and Publishing International Limited, Vol. 2015-January, pp. 796–803.

Saiz, L.C., Chordà, I.M., Perales, R.M.Y. (2018), Social and economic impact of the Seed Accelerators: Significant factors and implications for the social innovation, CIRIEC–España, Revistade Economía Pública, Social y Cooperativa, pp. 211–240, doi:10.7203/CIRIEC-E.93.9855.

Salwin, M. (2021), Design of Product-Service Systems in printing industry, PhD Thesis, Lappeenranta-Lahti University of Technology LUT, Lappeenranta.

Salwin, M., Kraslawski, A. (2020), State-of-the-Art in Product-Service System Classification, in: V. Ivanov, J. Trojanowska, I. Pavlenko, J. Zajac, D. Peraković, (Eds), Advances in Design, Simulation and Manufacturing III, Lecture Notes in Mechanical Engineering; Springer International Publishing, Cham, pp. 187–200, ISBN 978-3-030-50793-0.

Salwin, M., Kraslawski, A., Lipiak, J., Gołębiewski, D., Andrzejewski, M. (2020), Product-Service system business model for printing houses, Journal of Cleaner Production, Vol. 274, p. 122939, doi: 10.1016/j.jclepro.2020.122939.

Seet, P.-S., Jones, J., Oppelaar, L., Corral de Zubielqui, G. (2018), Beyond 'know-what' and 'know-how' to 'know-who': enhancing human capital with social capital in an Australian start-up accelerator, Asia Pacific Business Review, Vol. 24, pp. 233–260, doi: 10.1080/13602381.2018.1431250.

Seo, W.S., Hwangbo, Y., Ha, K.S. (2014), The current status and improvement strategy of the Korean start-up accelerators, Academy of Entrepreneurship Journal, Vol. 20, pp. 65–74.

Shankar, R.K., Shepherd, D.A. (2019), Accelerating strategic fit or venture emergence: Different paths adopted by corporate accelerators, Journal of Business Venturing, Vol. 34, doi: 10.1016/j.jbusvent.2018.06.004.

Shenkoya, T. (2021), A study of startup accelerators in Silicon Valley and some implications for Nigeria, African Journal of Science, Technology, Innovation and Development, Vol. 13, pp. 303–314, doi: 10.1080/20421338.2020.1746045.

Sota, F.G., Farelo, R.M. (2017), From labour flexibility to mobile identity: The «Startup» model within the framework of Spanish entrepreneurship, Revista del Ministerio de Empleo y Seguridad Social, pp. 171–188.

Stayton, J., Mangematin, V. (2019), Seed accelerators and the speed of new venture creation, The Journal of Technology Transfer, Vol. 44, pp. 1163–1187, doi: 10.1007/s10961-017-9646-0.

Tripathi, N., Oivo, M. (2020), The roles of incubators, accelerators, co-working spaces, mentors, and events in the startup development process, in: Fundamentals of Software Startups: Essential Engineering and Business Aspects, Springer International Publishing, Cham, pp. 147–159, ISBN 9783030359836.

Urbaniec, M., Żur, A. (2021), Business model innovation in corporate entrepreneurship: exploratory insights from corporate accelerators, International Entrepreneurship and Management Journal, Vol. 17, pp. 865–888, doi: 10.1007/s11365-020-00646-1.

Wallin, A.J., Fuglsang, L. (2017), Service innovations breaking institutionalized rules of health care, Journal of Service Management, Vol. 28, pp. 972–997, doi: 10.1108/JOSM-04-2017-0090.

Wójcik, P., Obłój, K., Wąsowska, A., Wierciński, S. (2020), Corporate acceleration process: a systems psychodynamics perspective, Journal of Organizational Change Management, Vol. 33, pp. 1163–1180, doi: 10.1108/JOCM-05-2019-0136.

Wright, M., Drori, I. (2018), Accelerators: Successful Venture Creation and Growth, Edward Elgar Publishing, ISBN 978-1-78643-409-8.

Yang, S., Kher, R., Lyons, T.S. (2018), Where Do Accelerators Fit in the Venture Creation Pipeline? Different Values Brought by Different Types of Accelerators, Entrepreneurship Research Journal, Vol. 8, p. 20170140, doi: 10.1515/erj-2017-0140.

Yin, B., Luo, J. (2018), How Do Accelerators Select Startups? Shifting Decision Criteria Across Stages, IEEE Transactions on Engineering Management, Vol. 65, pp. 574–589, doi: 10.1109/TEM.2018.2791501.

Zarei, H., Rasti-Barzoki, M., Moon, I. (2020), A Game Theoretic Approach to the Selection, Mentorship, and Investment Decisions of Start-Up Accelerators, IEEE Transactions on Engineering Management, doi: 10.1109/TEM.2020.2974532.