The evolution of scientific publishing about Startups in the third millennium: A Bibliometrics analysis

Roucham Benziane *, Mahmoudi Houcine **

Abstract: *The present study aims to explore the Start-up phenomenon in this third millennium, through monitoring its various definitions and capturing the evolution of scientific publications about Startups, by collecting all the scientific documents produced during 2000-2021 and containing the term "Startups" in their titles, a bibliometrics analysis was adopted; the study has revealed that 74,98% of them appeared in the a last ten yearly publications. Meanwhile, the scientific production about Startups is very crowded, at least three top subjects are interesting in this field, Engineering, business & management, and computer sciences. But the analysis by the author indicates that the top author became from medical sciences.*

Keywords: Startups; Bibliometric analysis; Scopus;Trends.

JEL Classification M13 ,C81, C55

تطور النشر العلمي حول الشركات الناشئة في الألفية الثالثة؛ تحليل بيبلبومتري

ملخص : تهدف الدراسة الحالية إلى استكشاف ظاهرة الشركات الناشئة في هذه الألفية الثالثة، من خلال رصد تعريفاتها المختلفة والتقاط تطور المنشورات العلمية حول الشركات الناشئة، من خلال جمع جميع الوثائق العلمية التي تم إنتاجها خلال الفترة 2000–2021 والتي تحتوي على مصطلح "الشركات الناشئة" في عناوينها، تم اعتماد التحليل البيبليومتري ؛ كما كشفت الدراسة أن 74،98٪ منهم ظهروا في منشورات آخر عشر سنوات. بالتوازي، فإن الإنتاج العلمي حول الشركات الناشئة غزير للغاية، وهناك ثلاثة مجالات رئيسية على الأقل مثيرة للاهتمام في هذا الحقل تمثلت في الهندسة، وإدارة الأعمال، وعلوم الكمبيوتر. لكن التحليل المتعلق بالمؤلف يشير إلى أن المؤلف الرئيسي ينتسب للعلوم الطبية

الكلمات المفتاحية : شركات ناشئة؛ تحليل بيبليومتري؛ سكوبس؛ اتجاه عام.

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1. Introduction :

Nowadays, the use of qualitative data analysis is gradually extending in the area of scientific production; different methods have appeared, including analysis of content, speech analysis, reporting analysis and bibliometrics.

The bibliometric aimed to assess scientific research in the fields of technology, engineering, business and economics, and social science (McKiernan, 2005; Shashikumara et al., n.d.).

Bibliometrics is frequently used to find the most influential journal, authors, countries and institutions. In addition, this approach is used to explain publishing trends. Though still seen as one of the best tools measuring the growth of scientific publishing for all fields.

In this direction, the Start-up phenomenon represents a vital topic worth investigating with these instruments; by the way, the term "Start-up" referred a few high-tech micro-companies primarily involved in electronics and computer technology. They were the first highly specialized chain connection in developing well-known advanced technology business network clusters, such as information technologies in Silicon Valley nanotech in Nano Mat, Germany, or photonics in the Scottish Photonic Glen (Photonics, 2018; Truman & Locke, 2016). At present, there are millions of Startups in the world, active in different areas, especially in the technology field; on the light of our introduction, we want to conduct the study for exploring the following:

-   **What Start-up means (its definitions, features, types)?**
-   **Evolution of publication on Startups during 2000-2021.**

Objectives:

-   To investigate the Start-up's research growth and progress.
-   Reviewing the subject fields through various paper styles analysis was conducted on Start-up.
-   To locate regional and structural contributions to Start-up research from around the world

Important of the topic:

-   Undoubtedly the importance of the subject attracts a grown interest from many academics, research centres and government owing to the economic weight of Startups in every economy; the importance rises from this study touches many levels including:
-   Refresh the knowledge of PhD students and researches of current science phenomena.
-   We are expanding knowledge concerning Startups by presenting a new statistic.
-   We are providing readers with the outputs of this study.

2. Background

The origin of Startups can be traced back to the 1970s. as stated in the Oxford Dictionary, the first use of the word "Start-up" in the new meaning occurred in 1976 in the biweekly Forbes, where "the business of investing in the Startups in the electronic data processing field" was mentioned (Forbes, 1976).

A year later, Business week, dated 5 November 1977, cited the term Startups in the title "incubators for Startups, operating in fast-moving industries related to high technology".

Although a growing number of scholars have been trying to capture and describe the unique specific characteristics of the Start-up phenomenon in recent years, there is still no general agreement as to what a Start-up is, both among scientists and business support institutions and among entrepreneurs themselves (Breschi et al., 2018).

In addition, Literature Review, every year, more and more research centres, consulting companies, and other organizations perform researches on Startups. However, the results of those projects don't conduct to a homogeneous picture because researchers suggest their understanding of the term "Start-up" instead of universally accepted definition; the word "Start-up" is described in a variety of ways in the literature. On the one hand, the prevalent approach in academia associates Startups with new businesses that join the market with minimal capital and no prior business experience. On the other hand, Startups are seen as highly creative and dynamically emerging by entrepreneurs and investors, besides the table below denotes some of these definitions.

3. Definitions of Startups

Table (1): Definitions of Startups with references

Definitions of Startups	References
For small high-tech start-up firms, exploitative relationships are formed to commercialize their existing technologies and ensure their current viability by making them more efficient in using what they already know	(Xia & Roper, 2016), Unpacking open innovation: absorptive capacity, exploratory and exploitative openness, and the growth of entrepreneurial biopharmaceutical firms. *Journal of Small Business Management,* p 936
James Bessen noted that from 1996 to 2006, the number of patent-holding Start-up firms, the same firms often thought of as the champions of innovation.	(Anderson, 2015), Software, abstractness, and soft physicality requirements. *Harvard Journal of Law & Technology,* 29(2), p 576.
The rise of the venture capital industry has led to the Emergence of Start-up companies founded to commercialize new technologies.	(Basol, 2012), Fabless semiconductor companies, the patent on-sale bar, and the new America invest act. *UCLA Journal of Law & Technology, p3.*
Startups, signifying by definition at the early, critical step of their development as called the sensitive periods in organizational development, try to attempt perfection in all aspects of their business activities.	(Shavinina, 2012), The Emergence of a new research direction at the intersection of talent and economy: The influence of the gifted on economy. *Talent Development &Excellence,* 4(1), p 69.
Throughout, we use the term venture to refer to any large expansion project by a new or existing firm and a new plant venture to denote a new manufacturing plant started by a new or existing firm. Start-up refers to the event of creating a new plant venture.	(Balasubramanian, 2011), New plant venture performance differences among incumbent, diversifying, and entrepreneurial firms: the impact of industry learning intensity. *Management,* 57(3), p549-550.
The main tool for the transformation of ideas into commercial innovations has been the creation and	(Bonaccorsi, 2011), European competitiveness in information

rapid growth of Start-up companies.	technology and long-term scientific performance. *Science and Public Policy,* 38(7) p 538.
Quinn and Cameron found four major stages: (One) entrepreneurial; (Two) collectivity; (Three) formalization and control; (Four) structure elaboration and adaptation. These stages may also be described as Start-up, rapid growth, equilibrium, and evolve or die.	(Chawla et al., 2010), Are small business critical success factors same in different countries? *SIES Journal of Management,* 7(1), p 4.
Venture-backed Startups are responsible for many of our most important innovations and highest-paying jobs. While Startups do create new jobs, the initial role of a Start-up is to draw wealth into a community. Startups do bring high salaries, but more importantly, they bring a high level of investment. High technology Startups require cutting edge equipment and facilities. It is important to inform residents to expect 1-2 out of 10 equipment and facilities. It is important to inform residents to expect 1-2 out of 10 companies to succeed. While they may not see an immediate benefit in terms of new jobs in the community, the economic activity stimulated by Startups is a valuable investment. VC has a significant impact on employment and the economy, but it takes time.	(Zaborowski, 2009), Opportunities in a recession. *Economic Development Journal*, 8(1), p 42,47.
The route for university entrepreneurship is From low tech entrepreneurship to capital accumulation and then to high-tech innovation or Startups.	(Zhou & Peng, 2008), The entrepreneurial university in China: nonlinear paths. *Science & Public Policy,*35(9), p 645.

Source: Elaborated by the authors, based on references

Throughout the definitions in the table, innovation is the only element that appears in all definitions. Startups are usually associated with new ideas, technology, and innovation.

Other elements like the Lifecycle, Investment, and Economic Impact factors were integrated into some studies; This was not seen as exceptional, Given the various characteristics on which different authors could wish to concentrate and the nature of the multiple studies.

Using a Start-up definition as a grouping criterion, the research publications on this topic may be grouped into three main categories: (Skala et al., 2019, p. 43)

- Startups understood as beginner companies in the early stages of operation,
- Startups are understood as new enterprises which commercialize scientific achievements, that is, new-technology-based firms.
- Startups are understood as entities creating and using (in their core activities) digital technologies (in other words, digital Startups, IT, or information and communication technologies [ICT]),

However, the most popular definition of a Start-up, widely cited in industry publications and scientific literature, was formulated by Steve Blank.

Blank claims (Blank, 2013) that "a Start-up is not a small version of a large company" and that Startups can be identified by their:
- Goals (intentions) that are very ambitious and aim towards becoming a large company that will have a significant impact on the functioning of existing markets or will create entirely new markets;
- Function, which, consistently with the definition quoted above, is a search for a business model, which in practice means continuous testing of business hypotheses, their verification, and possible modification of subsequent versions of the business model;
- A financing structure at the advanced stage of development includes funds obtained from external investors and results in a decreasing share of the founders in the company's capital.

4. Startups features

It can be summarized that four main features distinguish Startups from other enterprises: (Skala et al., 2019, p. 21)
- The young age of the enterprise and its limited resources (Startups are young companies with limited resources, especially financial ones),
- Innovation (Startups offer innovative solutions innovatively),
- Development and scalability (Startups are ambitious and fast-growing companies),
- The industry in which they operate (Startups are companies working in the digital sector, ICT, or, more broadly, technology companies).

types of Startups: according to Steve Blank's observations, there are six types as follows:
- lifestyle Startups: work to live their passion.
- Small-business Startups: work to feed the family.
- Scalable Startups: born to be big.
- Buyable Startups: acquisition targets.
- Social Startups: driven to make a difference.
- Large-company Startups: innovate or evaporate.

5. The top tech Startups of 2020

For everyone, particularly tech Startups, the year 2020 has been a difficult one. Despite the tragedy of many businesses going out of business, some tech Startups have managed to survive against the odds. We'd like to explore the top most promising tech Startups of 2020 according to the sites specialized for ranking the most valuable things in the world here are these Startups:

5.1 Air Garage: is a full-stack parking operator based in San Francisco that helps churches and businesses manage and rent out their parking lots. It was founded in 2018 by Chelsea Border, Jonathon Barkl, and Scott Fitsimones. It eliminates barriers to selling parking as a full-stack parking operator, allowing someone with an underutilized lot to get started. Air Garage offers a collection of methods for managing your aircraft.

5.2 Airtable: Last month, they named Airtable as one of the world's top 500 unicorn businesses. Airtable is a cloud-based software company based in San Francisco that blends a conventional spreadsheet with a database. It was founded in 2013 by Andrew Ofstad, Emmett Nicholas, and Howie Liu. It elevates the database from the domain of power users

to the mainstream, resulting in a new form of versatile yet sophisticated productivity tool that anyone can use. Airtable allows users to build and share their own workflows for a variety of tasks, from maintaining an editorial calendar to organizing a big event.

5.3 Capella Space: We've written about Capella Space many times in recent years. Capella Space has begun commercial operations with the launch of seven synthetic aperture radar (SAR) satellites. Capella, based in San Francisco, California, was founded in 2014 by Payam Banazadeh, Uri Tintore, and Will Woods to provide easy access to regular, timely, and versatile knowledge affecting dozens of industries. A network of small satellites provides coverage all over the world. Capella's technology is used by the US government's various branches, including the US Air Force. Capella is completely funded to launch its seven satellite constellation in 2020, with multibillion-dollar investments from DCVC (Data Collective) and Spark Capital.

5.4 Calm: Calm is another Start-up on the list of the world's top 500 unicorn firms. Calm, a San Francisco, CA-based provider of calming apps, raised $27 million in Series B funding in 2019 and plans to use the funds to continue to broaden its operations and market scope, including offline. Calm, founded in 2012 by Michael Acton Smith and Alex Tew, is a global meditation app. Calm is a global health and wellbeing brand that provides an app that allows users to meditate and relax. Calm also has a sleep, meditation, and relaxation app, which is available on both the App Store and Google Play. It has been downloaded upper 50 million times. Calm also produces audio material that improves mental wellbeing and addresses some of today's most pressing mental health issues: the stress anxiety, and depression.

5.5 Robinhood: This is the Start-up that doesn't need any further explanation. Millennials are particularly fond of it. In June of this year, 20-year-old student Alexander E. Kearns committed suicide after mistakingly believing he had a $730,000 contradictory balance on the Robinhood free-trading app. The company is grounded in Palo Alto, California. Vladimir Tenev and Baiju Bhatt, who had before established high-frequency trading platforms for financial institutions in new York city, formed Robinhood in April 2013. The company's name derives from its goal to "provide everyone, not just the rich, with access to the financial markets."

5.6 Bloomscape: founded in 2017 by Justin Mast and located in Detroit, MI, is an online plant shopping site that sells ready-to-plant plants as well as plant-care equipment. Bloomscape makes it easy to purchase plants by delivering ready-to-plant plants to its customers' doors.

6. Method:

This study assesses the increase of start-up research, which describes the rise in publishing, contribution, and impact of start-up research carried out globally by the researchers. to response properly at requirements of the search problem, a bibliometrics analysis used by collecting all the scientific documents produced during 2000-2021, extracted from Scopus databases on 20th April, 2021, and contain the term "Startups" in their titles, the bibliometrics analysis used as one of the largest tools to measure all trends, the authors have used the following criteria:
- Growth startup publications by year
- Published on startup: Various document types
- Coverage of subject areas

- Geographical contribution to startup research throughout the world
- The top three prolific authors on startup

Analysis by year Analysis by type of documents Analysis by area Analyze by Country Analyze by Author

7. Results:

7.1 **Analysis by year**

The production of most publications is growing since the beginning of the third millennium, this is why we select this period to analyze.

According to the Figure below, annual publications have increased by 79.6% in the last eighteen years.

Figure (1): Evolution of publishing about Startups during 1914-2018
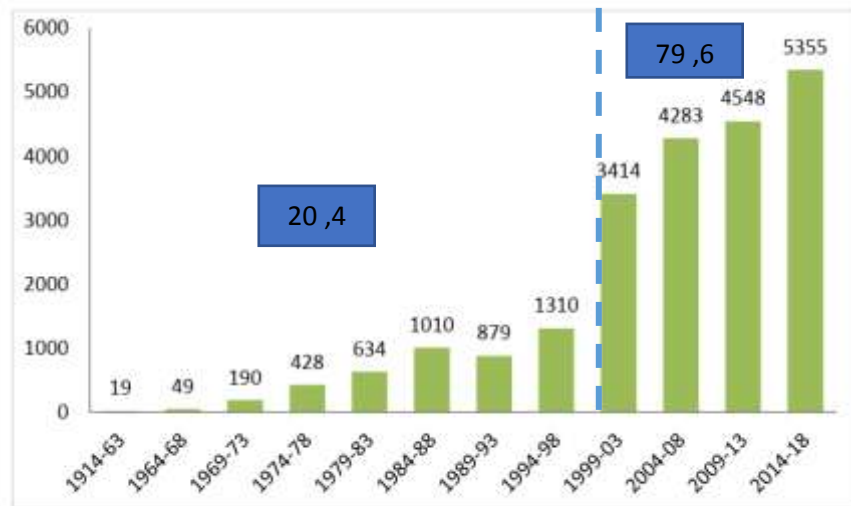
Figure 1: Year-wise publications growth

Table (2): Classification of Start-up's publishing weights by two period

Period	Nbr doc	%
1914-1998	4519	20,40%
1999-2018	17600	**79,60%**
1914-2018	22119	**100%**

Source: Elaborated by authors based on Fig 1

For this research, we will overview the period 2000 to 2021.

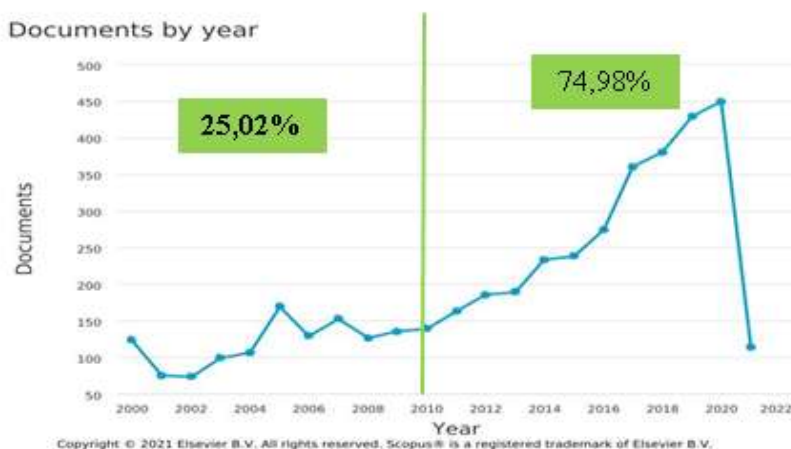**Figure (2): Evolution of publishing about Startups during 2000-2021**

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Table (3): Classification of Start-up's publishing weights by two period

2000-2009   &   2010-2021

Period	Nbr doc	%
2010-2021	3152	74,98%
2000-2009	**1052**	**25,02%**
2000-2021	4204	100%

Source: Elaborated by authors based on Fig 2

The Figure above indicates that 74,98% appeared at the last ten yearly publications

7.2 Analysis by type of documents

Figure 2 depicts the different categories of documentation that have been written on Start-up in different types.

Figure (3): Classification of publishing about Startups by type of document

during 2000-2021
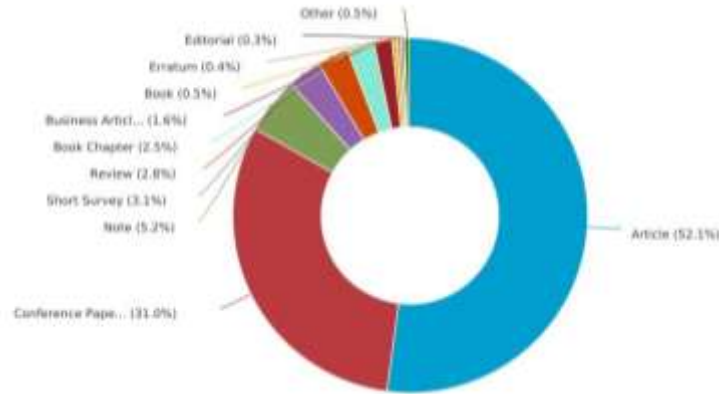
There are ten different forms of documents have been written, including, editorial, erratum, book, article, conference paper, book chapter, short survey, review, note, indicating that Start-up research has a high rate of publishing in all categories.

Journal articles account for the majority of publication (52.10 %), while conference papers accounting (for 31.0 %) and notes accounting for (5.2 %). Less than 3 % for every one of the other categories.

7.3 Analysis by area

Figure (4): Classification of publishing about Startups by subject area

during 2000-2021
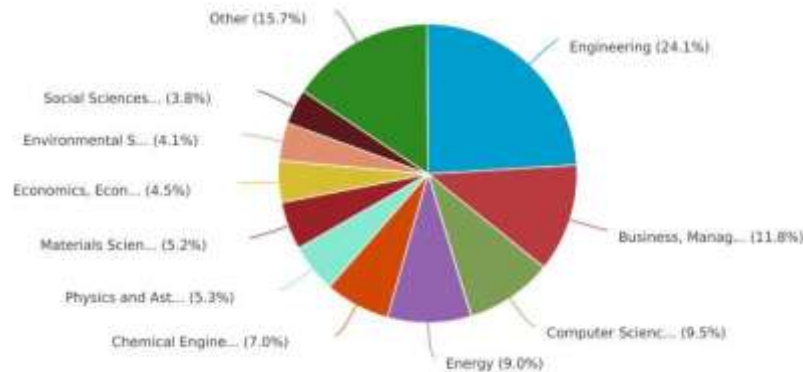
Engineering, computer sciences, Energy & environmental sciences, business & economics, and social science topics were all included in the Start-up study. Since Startups are a multidisciplinary field that touches on a wide range of topics.

Startups research covered (24.1%) engineering documents, followed by business management and economics (16.3%), then energy and computer sciences with (9.0%) for each one.

7.4 Analyze by Country

There are contributions from all around the world, Over than 90 countries have their contributions about the theme,

Figure (5) Geographical classification of publishing about Startups
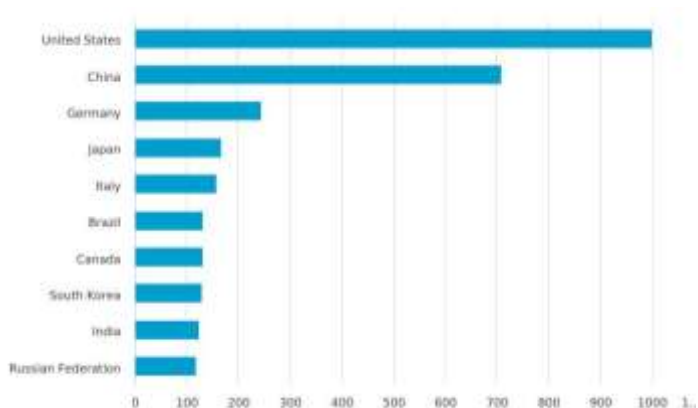
during 2000-2021

Figure 5 reveals that the United States and China are at the top of the Start-up publishing globe, followed by Germany and Japan.

7.5 Analysis by Author

Over than 150 researchers insert the term "Startups" in their documents, the three top authors have more than 33 documents per author:

• Parmar, A., has published in medical industry and health care journals.
• Abrahamsson, P., their papers from business and economics discipline.
• Wang, X their publications in the fields of computer sciences and software engineering.

The appendixes below shows the last documents of Parmar, A., Abrahamsson, P., and Wang, X.

The following seven researchers in the 2020 ranking have between 15 and 20 documents for each one.

Figure 6 classification of publishing about top authors

during 2000-2021
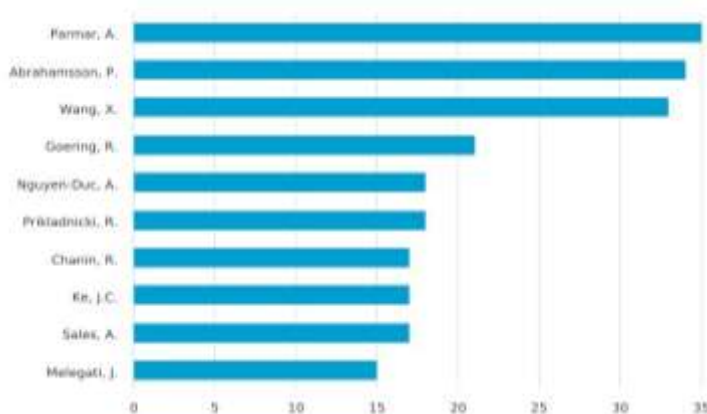
Conclusion

The study tries to explore the phenomenon of Startups by presenting the main definitions for a Start-up, formulated in the following communities: academics, entrepreneurs, investors, and business environment institutions. in addition it covers statistically the status and trends of Startups during the period 2000-2021, In general, the definition of a Start-up seems as follows:

• In the field of management practice Most frequently as a business model built on creativity, breaking ground, scalability, and a high rate of growth, and there are features distinguish it from other organizations.

• In the field of research, primarily as a new and temporary business with minimal financial and human capital at the outset, increasingly relying on external funds, both domestic and international, in subsequent growth stages.

• Among 74,98% of Startups appeared in the last ten yearly publications.

• The scientific production related to Startups is very crowded, and the three top subjects are Engineering, business & management, then computer sciences.

• The analysis by the author indicates that the top author belongs to medical sciences.

References:

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Zhou, C., & Peng, X. (2008). The entrepreneurial university in China: nonlinear paths. *Science and Public Policy*, *35*(9), 637–646.

Appendixes (1): The recent publications of the three top researchers

Parmar

Abrahamsson, P

View Abrahamsson, P's author details
View in Analyze author output
Affiliation: University of Jyvaskyla, Jyvaskyla, Finland

34 documents published by Abrahamsson, P matches your query
(Showing first 20 results)

Documents

Title	Authors	Year	Source
The Startup Scratch Book – Opening the Black Box of Startup Education	Abrahamsson, P., Suoranta, M., Lahti, S., Kemell, K.-K.	2021	Lecture Notes in Business Information Processing
Internal Software Startups - A Multiple Case Study on Practices, Methods, and Success Factors	Kemell, K.-K., Risku, J., Strandjord, K.E., (...) Wang, X., Abrahamsson, P	2020	Proceedings - 46th Euromicro Conference on Software Engineering and Advanced Applications, SEAA 2020
Business Model Canvas Should Pay More Attention to the Software Startup Team	Kemell, K.-K., Elonen, A., Suoranta, M., (...) Edison, H., Abrahamsson, P	2020	Proceedings - 46th Euromicro Conference on Software Engineering and Advanced Applications, SEAA 2020
Fundamentals of software startups: Essential engineering and business aspects	Nguyen-Duc, A., Münch, J., Prikladnicki, R., Wang, X., Abrahamsson, P	2020	Fundamentals of Software Startups: Essential Engineering and Business

Limit to   Exclude

Wang, X

View Wang, X.'s author details
View in Analyze author output
Affiliation: Free University of Bozen-Bolzano, Bozen-Bolzano, Italy

33 documents published by Wang, X. matches your query
(Showing first 20 results)

Documents

Title	Authors	Year	Source
Understanding Hypotheses Engineering in Software Startups through a Gray Literature Review	Melegati, J., Guerra, E., Wang, X.	2021	Information and Software Technology
MVP and experimentation in software startups: A qualitative survey	Melegati, J., Chanin, R., Sales, A., Prikladnicki, R., Wang, X.	2020	Proceedings - 46th Euromicro Conference on Software Engineering and Advanced Applications, SEAA 2020
Internal Software Startups - A Multiple Case Study on Practices, Methods, and Success Factors	Kemell, K.-K., Risku, J., Strandjord, K.E., (...) Wang, X., Abrahamsson, P	2020	Proceedings - 46th Euromicro Conference on Software Engineering and Advanced Applications, SEAA 2020
Fundamentals of software startups: Essential engineering and business aspects	Nguyen-Duc, A., Münch, J., Prikladnicki, R., Wang, X., Abrahamsson, P	2020	Fundamentals of Software Startups: Essential Engineering and Business

Limit to   Exclude

Appendixes (2): Analyze by Funding Sponsor