The State-of-the-Art of the Integration Platforms as a Service research

Hyrynsalmi Sonja M.

DOI: 10.1145/3524614.3528634

The State-of-the-Art of the Integration Platforms as a Service research

Sonja M. Hyrynsalmi
sonja.hyrynsalmi@lut.fi
LUT University
Lahti, Finland

ABSTRACT

As the world is digitalizing in the fast pace, there is a need for more reliable and scalable integration management. One popular option for modern integration management has been Integration Platforms as a Service (iPaaS). iPaaS is usually implemented to replace the old integration implementation models such as the point-to-point integrations or enterprise service buss. In this research, we are focusing on the state of the iPaaS themed research in the academic field. We also investigate what kind of different viewpoints or research gaps there are in the iPaaS research and how the term iPaaS has evolved and become more clearer during the years. In the results of our systematic literature review (n=14), we reveal that the majority of the iPaaS research has been focused on technological approach. However, now there are signs that iPaaS researchers are beginning to emphasize business-intensive approach, such as the importance of integration strategy or the selection of the right iPaaS platform to serve the enterprises business needs. This study calls for the further work in the area of integration management research.

CCS CONCEPTS

• **Information systems → Enterprise applications**; **Enterprise information systems**.

KEYWORDS

iPaaS, Integration management, Integration Platform as a Service, EiPaaS, Integration platform

ACM Reference Format:
Sonja M. Hyrynsalmi. 2022. The State-of-the-Art of the Integration Platforms as a Service research. In *5th International Workshop on Software-intensive Business: Towards Sustainable Software Business (IWSiB'22), May 18, 2022, Pittsburgh, PA, USA.* ACM, New York, NY, USA, 6 pages. https://doi.org/10.1145/3524614.3528634

1 INTRODUCTION

The rapid progress in the field of digitalization has also increased the number of integrations to the multiple systems. Integration as a term has always been at the same time clear and at the same time really hard to define in the field of software engineering. The unclear usage of integrations term can lead to the circular definitions that often lead to misunderstandings [8]. In this research we are focusing on system integrations, as we are discussing about Integration Platforms as a Service, a cloud-based platform solution which allows integration of multiple systems and solutions in different environments [6, 17, 21].

Integration Platforms as a Service (iPaaS) is a part of a larger movement of *Everything as Service* (aaS/XaaS/Eaas) [5] cloud-based software business transformation where services are provided for the customers over the internet. As a growing number of cloud integrations are challenging enterprises nowadays, the iPaaS implementations will meet many needs of different enterprises and are easy to adopt. Serrano et al. [17] defines iPaaS as *"a suite of cloud services that enable users to create, manage, and govern integration flows connecting a wide range of applications or data sources without installing or managing any hardware or middleware."*

iPaaS differs for example from ESB (Enterprise service bus) or EAI (Enterprise Application Integration) in many ways. ESB model provides integration of applications and services for complex architectures, such as middleware infrastructure platforms and EAI is a process of integrating software applications and software systems across enterprises[3, 12]. iPaaS is a cloud- and web-based platform, where can be different pre-built modules for smoother application integrations. iPaaS management does not usually need complex skill set, as the web-based user interfaces of iPaaS are mostly modular and graphical, ensuring the easy usage. Compared to the EAI/ESB projects, iPaaS projects usually last from a few days to weeks and they provide easily hybrid integrations between cloud and on-premises systems [6, 22]. The leading source for iPaaS business area is consulting and research company Gartner. Gartner publishes yearly a report called 'Magic Quadrant for Enterprise Integration Platform as a Service' [21]. In this report Gartner divides the iPaaS companies to the leaders, challengers, niche players and visionaries.

In the recent report Gartner recognizes, for example, iPaaS companies such as Informatica and Dell Boomi as a leaders and Jitterbit and Software AG as visionaries. In the niche section there has been the only two additions of the year 2020, Huawei and Integromat. There are also only two challenger right now in the quadrant: Tray.io and Talend. Many of these companies have one or more platform to offer alongside iPaaS and they are all the time renewing their platform service set. Overall iPaaS market is growing fast and new competitors comes every year to the market. In the Gartner's recent forecasts [4], it is expected that iPaaS market will exceed 9

IWSiB'22 , May 18, 2022, Pittsburgh, PA, USA

ACM ISBN 978-1-4503-9302-7/22/05…$15.00
https://doi.org/10.1145/3524614.3528634

billion dollar in revenue by 2025. Already in 2020 iPaaS market generated 3.47 billion dollar in revenue and grew by 38.7% compared to the year 2019.

As a term iPaaS has been evolving during the years. Recently Gartner, which has been leading the usage of iPaaS term, added an extension term for iPaaS, EiPaaS (Enterprise Integration Platform as a Service) [21]. EiPaaS term is still under definition, but basically it refers on more advantage management of integrations as a part of larger business strategy. Therefore, it is important to understand what iPaaS is, what it is not and what it will not be. Serrano et al. [17] for example point out in their research that iPaaS will not replace the need for SOA (service-oriented architecture). There is still need for traditional SOA in complex integration scenarios such as low-latency messaging and data-intensive transactions within and between enterprises.

Overall it is important for enterprises to understand that in which cases iPaaS solution would be beneficial for them and how to make the selection of the most suitable iPaaS [9, 13]. For understanding that, there would be need for well-founded empirical researches around in the domain of iPaaS theme. Ebert et al. [6] also point out in their research that the iPaaS research theme is still significantly under-researched and there is still a lack of research on critical success factors for using IPaaS as well as advantages and disadvantages compared to classical EAI.

Therefore, the purpose of this study is to review the current status of integration platforms as a service research in the academic literature. Moreover, we are investigating on which research approaches iPaaS studies are focusing and what potential research gaps there can be seen. We are approaching the research theme via two research questions:

RQ1 What is the current status of integration platforms as service (iPaaS) research?

RQ2 What kinds of research viewpoints have been used in extant literature about iPaaS?

RQ3 How the term iPaaS has evolved during the years and how it is understood by researchers?

In the following sections we are introducing our systematic literature review process and results. In the discussion section we are discussing about the need for more empirical research on the field and the future directions of the iPaaS term. The final section closes the study.

2 RESEARCH PROCESS

This study has been conducted as a literature study and the primary studies are collected by using a systematic literature review based on Kitchenham's guidelines [11]. According to Kitchenham, a systematic literature review is a fair and, to some extent, replicable approach to collect and select the primary studies from the extant literature for review and analysis work.

2.1 Search process

The search was conducted in January 2022 in Scopus database. Scopus is one the largest research databases which offers accurate search tools to go through academic publications. The search query used for this research was:

TITLE-ABS-KEY ("iPaaS" OR "Integration Platform as a Service")

We were searching the term iPaaS or phrase Integration Platform as a Service from the paper title, abstract or keyword. These research terms were chosen to get a representative and relevant set of research papers for the review.

The challenge in using just a research query "Integration platform" was in that it refers to the popular business management research theme where IT and business are merging, usually during the acquisition process. Therefore we chose to stay only in specific iPaaS research terms.

2.2 Inclusion and exclusion criteria

For this research we included papers, which were around the iPaaS theme, shared the common definition of iPaaS or used iPaaS approach in the case study or prototype. For this study we concluded all the English written, peer reviewed papers from books chapters, workshop papers and conference papers.

There were no year or a field limitation in the search query. Therefore, as pictured in the Figure 1, in the first analyze round there were 21 papers from overall 43 papers excluded (based on title, journal and abstract) because they were from the medical field and focusing for example on IPAA (ileal pouch–anal anastomosis) research. From the field of software engineering and computer science there were also three papers excluded, as they referred iPaaS as a IPAAS (Input PArameter Analysis System) which is not the same as Integration platforms as a Service (iPaaS).

One software engineering study was also excluded because although it mentioned iPaaS as one of the keywords in the paper, the actual research done in the paper was not about iPaaS or closely enough related to the iPaaS theme. One paper was also excluded because it was written in Germany and two papers were excluded because researcher could not find an access to the papers or their original publication venue.

2.3 Data analysis

The data was extracted from the Scopus as a CSV file and handled in the Excel. After the medical papers were excluded and all the publications, which were possible to find and access were collected and one paper written in Germany was excluded, researcher read through all the selected papers. In this phase, still one paper was excluded because it was not concerning iPaaS. When researcher started to categorize remaining papers, there were no pre-seed themes used. The approach types to the topic were evolved during the process. Under the main viewpoint themes, business-intensive and technological approach, there were following sub-approaches which are shown in Figure 2.

3 RESULTS

The timeline of iPaaS research papers revealed that the topic is fairly new in the computing discipline. While the first study found and included into this study has been published a decade ago in 2012, the overall number of studies remained small. However, from 14 publications included to this review, 9 were published in the year 2017 or after that. This might indicate an increasing scholarly interests towards iPaaS.

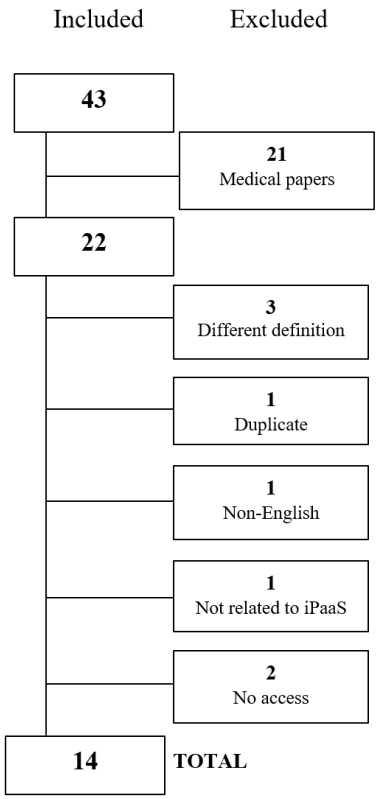

Figure 1: The overall illustration of the research process utilized, the number of studies in different phases and number of studies excluded for different reasons.

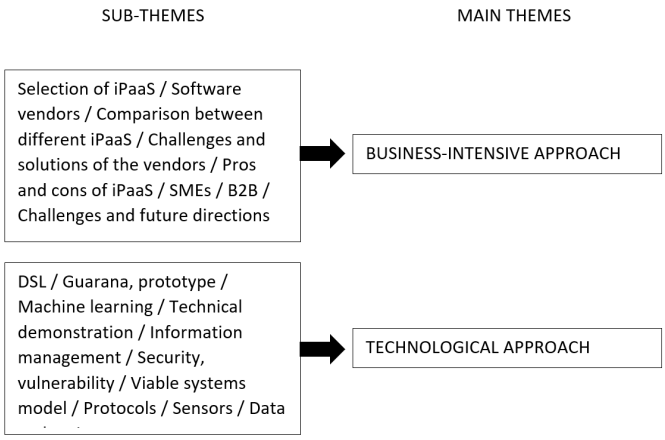

Figure 2: Categorization of the main viewpoints, business-intensive and technological, and their sub-themes identified from the selected papers

From all of the papers in this review, 6 papers were having business-intensive approach and 8 papers had a technological approach. A majority of the papers (9 papers) were conference papers, 4 of papers were journal articles and one paper was a book chapter. For this review, even the short conference or workshop papers were included as long as they had a focus on iPaaS theme.

3.1 The definition of iPaaS

As seen from the publication years of the papers in Table 3, the research field around iPaaS is still young. Therefore it is not a surprise that there has been also evolving around the definition and the approach to the iPaaS term. One factor which has been affecting to the more specific understanding and use of the term iPaaS is Gartner's Magic Quadrant for Enterprise Integration Platform as a Service report [21], which has been published yearly. This report has been also the one where researchers has been mostly found the exact definition and criterias for modern iPaaS solution and most of the papers in this review are referring at least one iPaaS report of Gartner.

During the early years of iPaaS research, some papers such as Jafarov and Lewis [10] were taking more ESB approach to the iPaaS defining. In the other hand, paper from Rosa-Sequeira et al. [16] takes an EAI approach to the understanding of the iPaaS. Rosa-Sequeira et al. framing of the iPaaS sounds more like the Gartner's new direction of EiPaaS. However, Gartner emphasizes that EiPaaS implementations are looking more strategic integration platform use for multiple, often business-critical integration projects, which is lacking in the Rosa-Sequeira et al. view of iPaaS.

During the early years there has been some variants and extensions of iPaaS term such SC-iPaaS which refers to the Sensor-Cloud Integration Platform as a Service [14, 15] and Infrastructure Platform as a Service [10]. Latter was still a proper iPaaS paper, because authors were referring for example to the Mulesoft, one of the leaders in iPaaS platforms. SC-iPaaS was a niche term for sensor and data integration management.

3.2 Technological approaches

Technological approach and prototype studies around different iPaaS implementations were representing majority of the papers. These 8 papers covered 13 sub-themes such as DSL, Guarana, prototype, machine learning, technical demonstration, information management, security, vulnerability, viable systems model, protocols, sensors, data and SC-iPaaS (Table 2).

Two research papers were focusing on the prototype example which were build via the Guaraná Cloud platform by using Domain-Specific Language (DSL). Research of Frantz et al. [7] developed a cloud-based web development platform for monitoring of integration solutions devised through Guaraná. Rosa-Sequeira et al. [16] uses Guaraná Cloud and DSL to demonstrate the use of integration platform to solve the information management challenges at Portugese research units. Most of the cases the used platform implementation was mentioned as in previous papers. In some cases the idea on iPaaS model was presented, but there were not necessarily some specific iPaaS product mentioned. This was the case for example of the paper of Srimathi & Krishnamoorthy Srimathi and Krishnamoorthy [18]. They approached the iPaaS topic via technical demonstration of iPaaS implementation for university data and integration management.

Table 1: Selected papers for this literature review

ID	Author	Year	Ref.	Type	Approach to the topic
1	Hyrynsalmi S.M. et al.	2021	[9]	Conference Paper	Business-intensive
2	Frantz R.Z. et al.	2021	[7]	Conference Paper	Technological
3	Neifer T. et al.	2021	[13]	Conference Paper	Business-intensive
4	Cestari R.H. et al.	2020	[2]	Conference Paper	Technological
5	Zhang X. & Yue W.T.	2020	[22]	Journal Article	Business-intensive
6	Srimathi H. & Krishnamoorthy A.	2019	[18]	Journal Article	Technological
7	Theilig M.-M. et al.	2018	[20]	Conference Paper	Business-intensive
8	Ebert N. et al.	2017	[6]	Journal Article	Business-intensive
9	Rosa-Sequeira F. et al.	2017	[16]	Book Chapter	Technological
10	Suzic B.	2016	[19]	Conference Paper	Technological
11	Jafarov N. & Lewis E.	2015	[10]	Conference Paper	Technological
12	Phan D.H. et al.	2014	[15]	Conference Paper	Technological
13	Phan D.H. et al.	2013	[14]	Conference Paper	Technological
14	Bolloju N. & Murugesan S.	2012	[1]	Conference Paper	Business-intensive

The paper of Cestari et al. [2] was an example of the modern iPaaS and EiPaaS implementations mentioned by Gartner, as authors were expanding the possibilities of iPaaS with the PM Engines, Machine Learning libraries and integration suites and libraries. Their missions is to develop a fully customizable and adaptable, open-source iPaaS and in this current research they were focusing on the industrial case study of their implementation solution.

Security and vulnerability issues were mentioned more or less in every technological study, but paper of Suzic [19] was focusing the most to the security issues in iPaaS implementations. Suzic presents a prototype and interoperability framework for security and interoperability of API based distributed services. In their future work they are planning to expand their framework API's management, automation and a web-based interface.

There were some specific iPaaS research papers focusing on sensor data management in cloud environment publishes in 2013 and 2014 by Phan et al. [14, 15]. These paper were focusing on optimizing three-tier communication in cloud-integrated sensor networks and multiobjective communication optimization for cloud-integrated body sensor networks. They were the most far away from the current iPaaS discussion, but they offered an overview for the data management possibilities in iPaaS implementations.

One example on the research done in the interface of the ESB and iPaaS implementations was a paper of Jafarov and Lewis [10]. In this research authors were focusing to the technological process management and Viable System Model principles in integration management.

3.3 Business-intensive approach in iPaaS adoptation

There were 6 papers under the theme of Business-intensive approach and 9 different sub-themes: selection of iPaaS, software Vendors, comparison between different iPaaS, challenges and solutions of the vendors, pros and cons of iPaaS, SMEs, B2B and challenges and future directions (Table 3).

What was common in business-intensive papers was that these papers focuses on to the business benefits of the iPaaS and the importance of the strategical adoption of the most suitable iPaaS implementation. One of the earliest papers focusing on the business and strategy viewpoint was the paper of Bolloju and Murugesan [1]. Their research paper was about cloud-based B2B systems integration for SME's and provided recommendations for adopting integration Platform as a Service (iPaas) for B2B integration. In their results, they came to conclusion that for medium-sized enterprises, with significant IT infrastructure investment, integration via on-premise application systems (and SaaS solution) through an iPaaS implementation created value the most. However, at the same time smaller enterprises could use more light-weighted iPaaS and SaaS implementations.

In the overview of the iPaaS evolution, Ebert et al. point out that iPaaS research topic still is lacking of empirical research around iPaaS [6]. Ebert et al. paper was published in 2017 and is the most cited iPaaS research paper for now. After their paper, there was three empirical paper published. Papers by Neifer et al. [13] and Hyrynsalmi et al. [9] were both focusing on software vendors and their attitudes towards iPaaS implementations, iPaaS adoptation and challenges observed during iPaaS projects and platform model. Hyrynsalmi et al. [9] approached topic especially about the selection between customized, on-premises solution and cloud-based, off-premises integration platforms and Neifer et al. [13] about the standardization of data models and the usability and variety of connectors provided. In both of these research, software vendors favored big iPaaS platform products, although in both of the research there were also seen challenges in big vendor interaction such as cost estimation problems and lack of customization possibilities.

The third empirical paper was Manilal's and Theertha's [20] paper about requirements for the development of an open iPaaS. They interview cloud service providers (CSPs), integration service providers (ISPs) and SMEs and identified 641 requirements and 67 sub-themes. Some of the themes were same as in the research of Hyrynsalmi et al. [9] and Neifer et al. [13] such as communication, documentation, standardization and interfaces.

The choice between ESB, EAI or iPaaS approach for the enterprise was pointed out in the research of Zhang & Yue. [22] and Ebert et al. [6]. These research papers different from the earlier iPaaS paper in that, that they already acknowledged the difference

Table 2: Technological approach: Sub-themes

ID	Author	Year	Ref.	Sub-themes
1a	Frantz R.Z. et al.	2021	[7]	DSL, Guarana, Prototype
2a	Cestari R.H. et al.	2020	[2]	Machine learning, Prototype
3a	Srimathi H. & Krishnamoorthy A.	2019	[18]	Technical demonstration
4a	Rosa-Sequeira F. et al.	2017	[16]	Technical demonstration, Information management, Guarana
5a	Suzic B.	2016	[19]	Security, Vulnerability
6a	Jafarov N. & Lewis E.	2015	[10]	Viable System Model, Protocols
7a	Phan D.H. et al.	2014	[15]	SC-iPaaS, Sensors, Data
8a	Phan D.H. et al.	2013	[14]	SC-iPaaS, Sensors, Data

Table 3: Business-intensive approach: Sub-themes

ID	Author	Year	Ref.	Sub-themes
1b	Hyrynsalmi S.M. et al.	2021	[9]	Selection, Software vendors, Pros and Cons
2b	Neifer T. et al.	2021	[13]	Selection, Software Vendors, Challenges and Solutions
3b	Zhang X. & Yue W.T.	2020	[22]	Selection, Software vendors
4b	Theilig M.-M. et al.	2018	[20]	SMEs, Software vendors
5b	Ebert N. et al.	2017	[6]	Challenges and Future Directions, Comparison, Selection
6b	Bolloju N. & Murugesan S.	2012	[1]	B2B, Selection

of the ESB or EAI and iPaaS. The paper of Zhang and Yue. [22] revealed that there are conflicting views on when and how to use these different integration implementations to fulfill integration needs. They also came to result that software vendors could gain higher network value by integrating it with on-premises software applications through ESB instead of iPaaS. Meanwhile, Ebert et al. discussed in their paper that if enterprises want to focus on integration between on-premise applications, an iPaaS might be the preferred choice compared to an EAI platform.

There were not seen a significant discussion around the risks of the iPaaS platform choice. The paper of Frantz et al. [7] was among the few which were mentioning the vendor lock-in in their research. They noted that all of iPaaS platforms are vendor-lock in practice, although some of them export the solution integration specification in formats such as XML documents and ease in that way vendor lock-in situation subtly. Risk were overall underrepresented in this review but for example paper of Ebert et al. [6] pointed out that the use of cloud-based iPaaS might require compliance checks with laws and internal regulations.

4 DISCUSSION

The aim of this research was to get an overview on how integration platforms as a service has been approached in the the academic research and what kind of research views there are around the topic. We also saw how the term iPaaS have evolved and become more clearer - and getting new evolution's such as EiPaaS.

We found out that while there is still lack of research around iPaaS, there is still seen a growing interest towards the topic as number of publications has been increasing during past few years. Majority of the papers still represented the technological approach to the topic, but there were more business-intensive iPaaS viewpoints published recently. However, the business-intensive approach was still underrepresented in the bigger research picture and more empirical research would be needed, as was also stated by Ebert et al. [6] in their conclusions already in 2017. Especially the possibilities and challenges for enterprises and the deeper understanding of the risks of iPaaS implementations were lacking from the wider research as the were only couple papers which laid more focus on risks [6, 7]

Overall, this study is one step to get closer the different aspects, challenges and questions in the modern integration management. However, integrations are usually seen self-evident part of the software business and so it seems to be with integration management research. Despite the long-lasting interest by the industry and industrial consults such as GartnerDsilva et al. [4], Thoo et al. [21], the academic interests to address question related to iPaas are modest, at the best. There are several possible explanations for this.

Firstly, it can be seen that iPaaS is just a marketing term introduced by companies without much content and it therefore have not catch fire in the academia. Yet, these kinds of fads often fade away from the public discourse relatively fast. So on the contrast to that, iPaaS terminology has been present over a decade. Secondly, integrations have never been among the popular topics in the academic research field. Although functional and stable integration flows are crucial for enterprises competitiveness, modern iPaaS products, which could foster these elements, still does not catch the popularity in the research. It seems to be that the golden age of integration research was when research around ESB and EAI theme was more popular.

There was also seen how the understanding and the definition of the iPaaS have been evolving during the years. In the earliest research papers about iPaaS, it was unclear how ESB and IPaaS different from each other and in some cases iPaaS implementation process and idea was handled as similar to the ESB idea. Similar observations were also made the differentiation of EAI and iPaaS. However, in the most recent papers there were seen that there was

a clear differentiation of the ESB or EAI and iPaaS. However, the definition of iPaaS can still evolve as Gartner has been introduced the new iPaaS term, EiPaaS (Enterprise Integration Platform as a Service).

In the future it is interesting to follow up Gartner's taxonomy project on EiPaaS term and the effects of that to the taxonomy evolution of iPaaS and will that for example affect to their Gartner's Magic Quadrant for Enterprise Integration Platform as a Service research. Will there be some clearer definition what is iPaaS and what is EiPaaS and is there more business-intensive focus on that - as now EiPaaS is mentioned to be somethings, which drives more from the business needs than iPaaS. Furthermore, at least right now EiPaaS is still unnoticed in the academic research and it is also interesting to follow up if EAI and EA (Enterprise architecture) scholars take a lead of EiPaaS research.

Finally, there are some noteworthy limitations that deserved to be discussed and can be counted as threats to validity. First, challenges with the iPaaS term is also one of the limitations of this research. There can be more research papers concerning this topic area, but they not necessarily speak about iPaaS or Integration platform as a Service. Potential taxonomy in these missing papers can move around terms such as hyperautomation, IT modernization, microservices or cloud-integration. The right terminology and common understanding of shared terms is also one limitation for the systematic literature review method. Therefore, to get more deeper understanding the shift in iPaaS, the importance for the business and the future directions, either a deeper systematic literature review (by using snowballing technique or specific iPaaS product names in search query) or grey literature review could be beneficial in the future research. Those could help to find maybe more shared terminology from this research area and help form more specific research on what kind of integration management models there are and in which cases they can be used as tehy have been now papers on when to use ESB, EAI or iPaaS [6, 22]

Second, the analysis and the categorizations presented in this papers are objective and based on the expertise of the author. Due to the rich diversity in the selected publications, their venues and academic writing culture, not all details might have been acknowledged. Yet, as the number of studies remain a small, enough time were spent on analysis on the selected papers.

5 CONCLUSION

In this research we conducted a systematic literature review about Integration Platform as a Service research. We found out that the iPaaS theme is still significantly under-researched, although there was seen a subtle growth in the number of iPaaS publications in past few years. We also revealed that alongside technological research approach to the iPaaS, the business-intensive research approach have been growing their share. However, we see that there is a need for more deeper empirical research around iPaaS selection, benefits and risks and challenges to get proper understanding the modern integration management implementations. We also discussed the definition of the iPaaS term, how it has evolved during the years and how does the new EiPaaS term effect to the iPaaS research field.

ACKNOWLEDGMENTS

This research was supported by Academy of Finland, project #328737: *Strategic approach to scalable platform based software and systems development* and the Finnish Foundation for Technology Promotion.

REFERENCES

[1] Narasimha Bolloju and San Murugesan. 2012. Cloud-based B2B systems integration for small-and-medium-sized enterprises. In *Proceedings of the International Conference on Advances in Computing, Communications and Informatics*. 477–480.
[2] Rafael Huang Cestari, Sebastien Ducos, and Ernesto Exposito. 2020. iPaaS in Agriculture 4.0: An Industrial Case. In *2020 IEEE 29th International Conference on Enabling Technologies: Infrastructure for Collaborative Enterprises (WETICE)*. IEEE, 48–53.
[3] David A Chappell. 2004. *Enterprise service bus.* " O'Reilly Media, Inc.".
[4] Vanitha Dsilva, Laurie Wurster, Fabrizio Biscotti, Bindi Bhullar, Brandon Medford, Sharat Menon, Shailendra Upadhyay, Rahul Yadav, Chandra Mukhyala, and Robin Schumacher. 2021. *Forecast: Enterprise Infrastructure Software, Worldwide, 2019-2025.* Technical Report. Gartner Research.
[5] Yucong Duan, Guohua Fu, Nianjun Zhou, Xiaobing Sun, Nanjangud C Narendra, and Bo Hu. 2015. Everything as a service (XaaS) on the cloud: origins, current and future trends. In *2015 IEEE 8th International Conference on Cloud Computing*. IEEE, 621–628.
[6] Nico Ebert, Kristin Weber, and Stefan Koruna. 2017. Integration platform as a service. *Business & Information Systems Engineering* 59, 5 (2017), 375–379.
[7] Rafael Z Frantz, Rafael Corchuelo, Vitor Basto-Fernandes, Fernando Rosa-Sequeira, Fabricia Roos-Frantz, and José L. Arjona. 2021. A cloud-based integration platform for enterprise application integration: A Model-Driven Engineering approach. *Software: Practice and Experience* 51, 4 (2021), 824–847.
[8] Thomas Gulledge. 2006. What is integration? *Industrial Management & Data Systems* (2006).
[9] Sonja M Hyrynsalmi, Kari M Koskinen, Matti Rossi, and Kari Smolander. 2021. Towards the utilization of Cloud-based Integration Platforms. In *2021 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*. IEEE, 1–8.
[10] Nizami Jafarov and Edward Lewis. 2015. Reinterpreting the principles of SOA through the cybernetic concepts of VSM to design the ESB as iPaaS in the cloud. In *2015 Science and Information Conference (SAI)*. IEEE, 850–858.
[11] Barbara Kitchenham. 2004. Procedures for performing systematic reviews. *Keele, UK, Keele University* 33, 2004 (2004), 1–26.
[12] David S Linthicum. 2000. *Enterprise application integration.* Addison-Wesley Professional.
[13] Thomas Neifer, Dennis Lawo, Paul Bossauer, and Andreas Gadatsch. 2021. Decoding IPaaS: Investigation of User Requirements for Integration Platforms as a Service. In *Wijnhoven, van Sinderen (Eds.): Proceedings of the 18th International Conference on e-Business, ICE-B 2021, July 7-9, 2021*. SCITEPRESS-Science and Technology Publications, 47–55.
[14] Dung H Phan, Junichi Suzuki, Shingo Omura, and Katsuya Oba. 2013. Toward sensor-cloud integration as a service: Optimizing three-tier communication in cloud-integrated sensor networks. In *Proceedings of the 8th International Conference on Body Area Networks*. 355–362.
[15] Dung H Phan, Junichi Suzuki, Shingo Omura, Katsuya Oba, and Athanasios Vasilakos. 2014. Multiobjective communication optimization for cloud-integrated body sensor networks. In *2014 14th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing*. IEEE, 685–693.
[16] Fernando Rosa-Sequeira, Vıtor Basto-Fernandes, and Rafael Z Frantz. [n. d.]. ENTERPRISE APPLICATION INTEGRATION: APPROACHES AND PLATFORMS TO DESIGN AND IMPLEMENT SOLUTIONS IN THE CLOUD. ([n. d.]).
[17] Nicolas Serrano, Josune Hernantes, and Gorka Gallardo. 2014. Service-oriented architecture and legacy systems. *IEEE software* 31, 5 (2014), 15–19.
[18] H Srimathi and A Krishnamoorthy. 2019. Integration of student system using iPaaS. *International Journal of Scientific and Technology Research* 8, 9 (2019), 602–606.
[19] Bojan Suzic. 2016. User-centered security management of API-based data integration workflows. In *NOMS 2016-2016 IEEE/IFIP Network Operations and Management Symposium*. IEEE, 1233–1238.
[20] Max-Marcel Theilig, Thorsten Pröhl, and Rüdiger Zarnekow. 2018. Requirements Analysis for an Open iPaaS: Exploring the CSP, ISP, and SME View. (2018).
[21] Eric Thoo, Keith Guttridge, Bindi Bhullar, Shameen Pillai, and Abhishek Singh. 2021. *Magic Quadrant for Enterprise Integration Platform as a Service.* Technical Report. Gartner Research.
[22] Xiong Zhang and Wei Thoo Yue. 2020. Integration of on-premises and cloud-based software: the product bundling perspective. *Forthcoming in Journal of the Association for Information Systems* (2020).