Digital Platforms and Enterprise Agility: A Systematic Literature Review

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Abstract. In the age of industry 4.0, digital platforms are becoming highly influential with their ability to facilitate the exchange, cooperation and coordination among enterprises. In spite of the significant role of digital platforms, only few research works directly explain their development and applications. This paper aims to provide an overview of digital platforms and their impact on agility using a systematic literature review. The results provide insights into digital platforms' capabilities, challenges, and synergies with agility in the manufacturing sector.

Keywords: Digital platform · Industry 4.0 · Manufacturing platform · Enterprise Agility

1 Introduction

Organizations are more and more working on their agility and efficiency trying to unleash the potential of technologies to better cope with the continuously evolving world. This includes such technology as digital platforms which is intertwined with Industry 4.0. According to Zhou et al. [1] and Oztemel et al. [2], Industry 4.0 is a strategic initiative to generate intelligent factories and products -that constitute the backbone of smart manufacturing- through the use of advanced information and technologies. A typical Industry 4.0 scenario can be defined as an integrated, adapted, optimized and service-oriented manufacturing process that comprises big data and high technologies [3]. Industry 4.0 involves the design and management of sophisticated and adaptable systems that incorporate digital manufacturing technology, network communication technology, computer technology, automation technology, and a variety of other fields [1]. The common purpose of these technologies is to improve the communication, interaction and exchange among software and physical objects as well as delivering valuable information quickly from various data types [1, 4]. In addition, Industry 4.0 entails in boosting the value creation process and advances in flexibility and agility [5, 6].

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However, data is becoming ever more accessible in many industries, making hard to process data properly and to provide the right information for the right purpose at the right time [4]. Moreover, it is hard to manage and deal with this massive amount of data, and this is considered as a major challenge in Industry 4.0. In this context, digital platforms have the potential to reshape the traditional value creation by supporting information sharing and management, product development supply and demand matching [7–9]. Digital platforms exist in different sectors since the advent of sharing economy. Both products and services are traded through digital platforms. In any case, the use of digital platforms for acquiring products or services is seen as outsourcing a business function by companies. When it comes to manufacturing, digital platforms has been fostered by manufacturing servitization, or Manufacturing-as-a-Service (MaaS). In particular, digital platforms represent game changers for what concerns the relationship between suppliers and customers. Business models and companies' inter-relationships could be extensively transformed and improved by the use of digital platforms [9–11]. Previous researches uncovered a positive correlation between SMEs agility and their capability of using digital platforms [12]. Thus, digital platform represents a growing field that is challenging the essential of organization performance [13].

Despite their expanding relevance, digital platforms remain poorly understood with lack of shared definitions and theoretical frameworks for researching and assessing them. There are only few papers that are directly relevant to digital platforms development, where most of the papers are focusing on other technologies in Industry 4.0, such as examining the benefits of implementing information and communication systems ICT for Organization performance [14, 15].

As a result, there is still a lack of comprehensive knowledge on how digital platform may affect business performance and business agility [8]. Therefore, a systematic literature review (SLR) is needed to uncover research gaps in this area. Overall, the SLR technique offers a rigorous and thorough way to conduct research on a certain issue [16].

The aim of this work is to provide an overview of digital platform concept, applications, challenges, and synergies with organizations' agility. The reminder of the paper is structured as follows: Sect. 2 gives a brief background on the topic. Section 3 explains the research method. Quantitative results of the SLR are illustrated in Sect. 4. Next, Sect. 5 refers to the main capabilities and challenges of digital platform. Section 6 describes the impact of digital platform on organizations' agility. The paper ends with concluding remarks in Sect. 7.

2 Background

The deployment of Industry 4.0 involves digital design and simulation, process management and highly automated manufacturing processes [1]. It also involves a complete digitalization (i.e. implementation of digital technologies) and interconnection of the value creation [17, 18]. According to Cenamor et al. [8], in the past two decades research has studied how those digital technologies can improve the overall operational efficiency and customer orientation in order to match market needs. In this regard, technical advancements have promoted the introduction and the adoption of more advanced technologies, known as digital platforms [19].

Digital platforms are technological building blocks that serve as a basis for a variety of firms, grouped into a set of interconnected firms, to generate a range of interrelated product, technologies, and services [11]. Intelligent human-machine interactions within a complex industrial environment can be developed in the future to attain manufacturing intelligence [4].

Collaboration is a fundamental concept in Industry 4.0 and digital platforms, it involves collaboration between humans and machines using cognitive technology as well collaboration between organizations. Collaboration is closely related to, and fostered by, the relation capital which refers to the value produced from high-quality connections and interactions between persons and organizations [12]. It entails the sharing of knowledge, learning, and trust amongst stakeholders like as workers, customers, and partners. Relational capital is critical for organizational performance since it helps to build and sustain strong relationships both inside and outside. However, many collaboration challenges emerge from the characteristics of Industry 4.0, precisely, in digitalization of products and services such as [20]:

- Utilizing the idea of smart product requires efficient cooperation across nodes of the value chain that use smart product to mediate their collaboration.
- Effective historical records and tracing can only be kept up to date and related with the product through collaboration.
- The availability of data adjacent to the product is dependent not only on technological infrastructure, but also on coordination among all stakeholders participating in the "product history".
- Incorporation of support and other value-added services often necessitates inputs from several stakeholders, implying at least some basic degrees of collaboration - the "smartness of the product" being their shared purpose.
- Smart products will inspire/motivate the development of new services to increase the value of products, hence developing cooperation communities linked with the product (product-related digital ecosystems).
- Synchronization of information sharing and data flows between stakeholders call for advanced IT solutions, not yet fully available on the market, as well as for secure communication.

Recently, the use of digital platforms has grown and exceeded the functional IT level by having a bigger role in strategic and management level [21]. In this regard, several examples of digital platforms are observed in the market (Digital Platforms in Manufacturing Industries Report [9, 22]).

- **Manufacturing platform for sheet metal bending (CADDI)** is a digital manufacturing platform that provides an online store for the purchase of bended sheet metal components. It enables interested parties to seek an estimate and order components at competitive pricing, excellent quality, and on-time delivery in a timely and effective manner.
- **Xometry** evolved from an on-demand parts provider to an online manufacturing platform. It provides several family parts and manufacturing services in areas such as machining, 3D printing, cutting, sheet metal, etc. A quick quotation process using generally CAD models and other is put forth within the platform.

- **An Organizer of Supply Chain For Apparel Companies (Sisateru**) is a cloud service that supports apparel operations. It's an apparel supply chain organizer that provides an online shop for the purchase of assembled textile goods. Sitateru generates a price based on their in-house system for monitoring supplier manufacturing lines once interested parties supply CAD design data or product requirements.
- **IoT platform (Landlog**) is an open innovation platform for construction enterprises that provides software tools to make construction work more productive. The platform offers a variety of options, including controlling truck capacity and trip time, and managing supplies, vendor procurement, and delivery dates efficiently. Landlog intends to specialize in civil engineering and construction by collecting data that will increase the accuracy and capability of each application.
- **The FANUC FIELD system** is a platform that provides software applications for monitoring the utilization status of manufacturing assets such as robots and machine tools. An interested manufacturing organization can choose a suitable program on the platform to view the running state of machines and obtain maintenance information. It integrates all production equipment at the manufacturing site to aggregate information for improved efficiency and continuous production in the plant.
- **V-Industry Brokerage of machine resources**: is a platform that links enterprises with accessible manufacturing capacity to those in need of produced items, with a present emphasis on metalworking machinery. V-Industry can evaluate the present capacity utilization of machines and find free production resources by inserting a hardware component into them. Requesters can upload 3D models of their desired goods, as well as production processes and other specifications, and V-Industry will utilize a matching algorithm to pick possible suppliers with the necessary manufacturing capacities and capabilities.
- **Siemens Mobility's Railigent platform** provides a cloud-based solution enabling train owners and operators to improve the availability of their trains, infrastructure, and signalling as well as improve maintenance and operation, and save costs. The platform is able to analyse vast volumes of data from the railway environment and generates relevant insights and suggestions for the client using powerful machine learning and artificial intelligence algorithms.
- **German SCM platform** targets manufacturing industry. It helps integrate and execute all kinds of SCM processes, such as purchasing and sourcing, across industries. Suppliers can be integrated further into proprietary systems, and smart solutions which offers further possibilities, such as tracking and tracing.
- I**ndustry 4.0 internal supply platform** provides a market place and allows for matching supply and demand. It offers possibilities for the integration of supply processes reaching from suppliers to users.
- **Industry/ecosystem platform** targets automotive industry. It offers a wide variety of services such as infrastructure-platform, and software-as-a-service. It aims for intelligent interconnection of industrial business partners, eventually leading to enhanced and novel BMs.

Even though the interest and the use of digital platforms is increasing, they are still poorly understood, especially in terms of their capabilities and impact on business performance and on business agility [8, 9].

3 Research Method

In order to explore the scientific literature and address the research problem, SLR was used as the backbone of the research method. SLR refers to collecting information to answer a particular research problem. This requires tracking down all primary research suitable to the reviewed topic, analysing them critically, and summarizing the findings. However, SLR may incorporate several types of results from different scientific paths for assessing the context. Therefore, the research needs to be driven by the interest in a topic and the need to address a specific question. PICO (Population, Intervention, Comparison, and Outcomes) format [23], is frequently used to guide the literature review, frame the review question, and shape the search query [24].

PICO breaks down the question into four components [23]: *Population/problem* addressing the specific nature of the problem, *intervention* which characterizes the primer considered solution, action, or procedure, Comparison/*Control* which aims to compare the intervention with the main alternative or the existing one and *Outcome* addressing the effect of the intervention.

In this work, the demographics of interest are the firms functioning in the networked production and manufacturing sectors. The intervention under consideration is the use of digital platforms and related Industry 4.0 technologies within production processes. The investigation of this work has no particular comparison. The aim of this work is to understand and to assess the impact of utilizing digital platforms on firm's agility. As a result, the research question for this SLR is as follow: *How organizations' agility is affected by (O), and what are the benefits and challenges for developing digital platforms and related Industry 4.0 technologies (I) in networked production and manufacturing domains (P)?*

The search query is designed to retrieve the relevant studies from the database, to be analysed and synthesized to provide insights toward answering the research question. The query is developed to capture studies that focus on the use of Industry 4.0 and digital platforms in the context of manufacturing and production, with a specific interest in enterprise agility, flexibility and resilience as shown in Fig. 1.

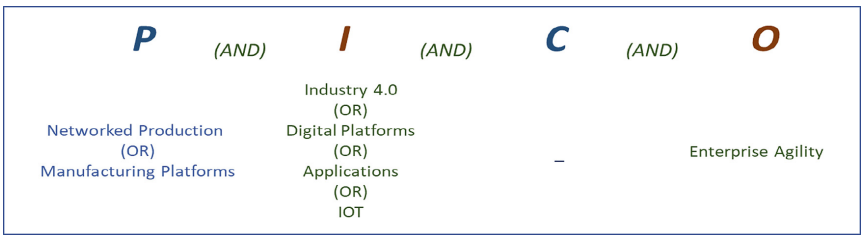

Fig. 1. The Search query using PICO format

In order to ensure the quality and the transparency of the SLR, PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method is adopted [25]. PRISMA is a widely recognized evidence-based approach for reporting systematic reviews and meta-analysis. It has been broadly valued in the health field [16]. Generally,

PRISMA statement includes 27 checklists and a four-phase flow diagram [25]. According to Moher et al. [26], flow diagrams support reviewers by requesting information on different phases of the review process. Following that, Fig. 2 presents the flow of the article selection process.

The included articles in this study are the ones reporting on studies related to the use of digital platforms and Industry 4.0. More precisely, in the context of manufacturing and production, and their impact on enterprise agility, published in English and conducted between 2011 and 2022. Excluded studies are the ones that are not related to current research question and the ones that are published without peer-review. Some papers were added during the analysis phase since they were mentioned in the reference lists of the selected ones.

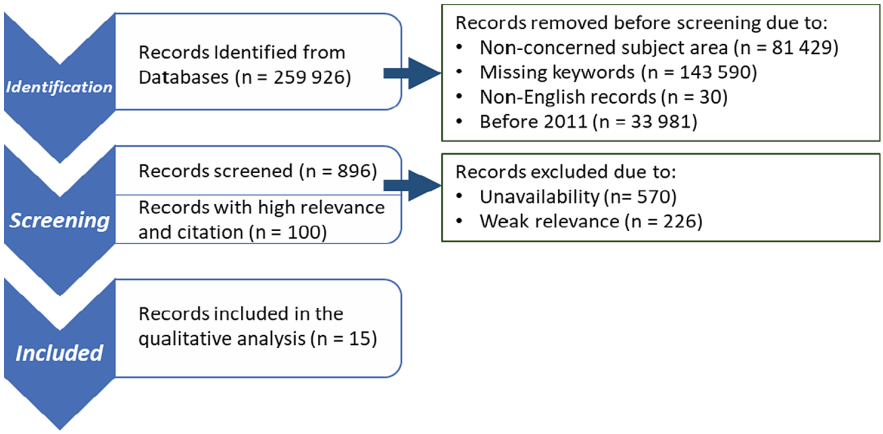

Fig. 2. Flowchart for the study selection process

4 SLR Results Overview

The search query was applied on Scopus database to search and gather the published between 2011 and 2022. Figure 3a shows a steady increase in paper numbers on this topic. It shows the published documents on intelligent manufacturing from 2011 to 2022. From 2017 to 2022, the number of articles increased sharply, reaching 38 papers. Figure 3b lists the approximate percentage of publications by research area. The top four subject areas are Engineering (27%), Business management (19%), Computer science (19%), and Decision science (11%). The top five sources publishing works related to Industry 4.0 and digital platforms (with the number of papers), are as follow: Sustainability (9), Journal of Manufacturing technology management (5), Procedia CIRP (4), IFIP Advances In Information And Communication Technology, and International Journal of Computer Integrated Manufacturing (3), respectively.

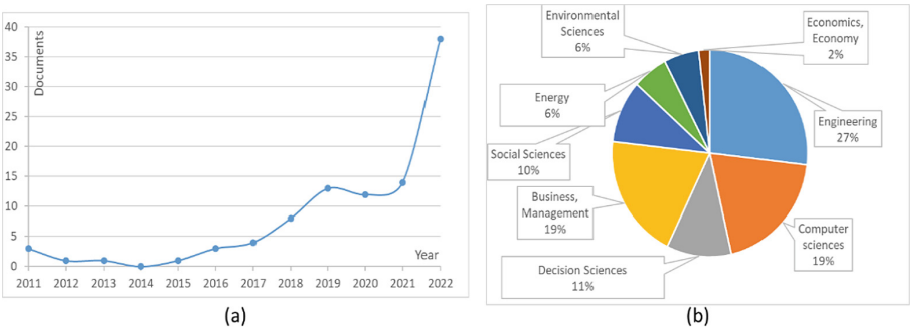

Fig. 3. Statistics from Scopus database. (a) Number of documents from 2011–2022. (b) Publications research area.

5 Digital Platforms Benefits and Challenges

The capability of digital platforms refers to an organization's ability to use advanced digital tools and technologies as competitive instruments. Understanding this capability helps firms adapt to highly changeable market needs. Through, incorporating strategic knowledge sources using digital technology, while reconfiguring internal and external resources to better respond to dynamic and volatile environments [12]. Digital platforms can aid business operation through providing different technical elements to facilitate business flow, deploying Information and Communication Technology (ICT) resources in combination with other internal and external resources [8].

Generally, organizations can achieve a sustainable competitive advantage through the efficient utilization and management of digital technologies. According to Adeel et al. [12], digital platforms are referred as a way to establish information technology infrastructure. They permit enterprises to digitally create conglomerates with their partners and enable organizations to reduce their costs and increase their revenues. Furthermore, they help transform the structure of key enterprises and are likely to force traditional organization to their business models. This consideration is valid for digital platforms offering services, thus mostly used by production departments (e.g. for maintenance, asset monitoring, etc.) and for digital platforms offering products, thus mostly used by supply chain and planning departments (e.g. for outsourcing, raw materials or semi-finished products supply, etc.).

Moreover, customer experience could be improved through digital platforms. They support more efficient operation through automating and streamlining diverse business processes. They also facilitate the communication and the collaboration and provide real-time data and analytic. However, the use and the implementation of digital platform is not an easy task, in which their adoption may face different challenges.

Digital platforms are an integral part of Industry 4.0 technological revolution. Therefore, issues that arise from the adoption of digital platforms can be obtained by comprehending Industry 4.0 related issues. The development of Industry 4.0 vision raises different challenges, especially as in the networked manufacturing participants apply different policies. Among these challenges [27]:

- Interoperability that incorporates the management of new and old data formats. This could be considered as a challenge for digital platforms, as they face issues in integrating with different systems and devices, especially when different technologies and devices are used.
- The difficulty that comes from the idea of having global unique identification that links Industry 4.0 components and the generated information to ensure an effective data exchange and coordination. This could be a relevant challenge for digital platforms, where the different entities should be recognized uniquely.
- Furthermore, since industry 4.0 and digital platforms require coordination between several stakeholders, they both need to adhere to common standards, and develop a consistent data model, in order to step towards the realization of Industry 4.0 and manage digital platforms.

Moreover, there is a need of having clear performance metrics to evaluate the effectiveness of the digital platforms and to make data-driven decisions. Beside the challenges in real life implementation, there is a lack of clear definitions for digital platforms in literature, from the perspective of involved actors, target business model and data model and flow.

6 Digital Platforms and Agility

Recently, business sector is known to being extremely dynamic and competitive. Therefore, firms need to be agile to modify and adapt their activities and strategies [28]. With such rapid evolution in business landscape, it is become important to explore the potential effect of digital platforms in organizational agility. Organizational agility (OA) represents a competence that allows firms to adapt to contingencies posed by the environment. OA enables firms to streamline their operations, leverage their network and enhance customer satisfaction [28].

The work of Ravichandran [28] conclude and conceptualize OA, based on an illustrative summary of definitions in information system, as an enterprise ability to react with speed to environmental changes and opportunities. It is defined in terms of three different dimensions: customer responsiveness (ability to assess customer requirements, customizing products and services to meet those requirements, identifying customer group, and responding to customer demand); operational flexibility (the capacity to streamline process and improve development cycle speed); and strategic flexibility (firm's capacity to enter new market). Overall, it can be stated that OA enables firms to redesign their business operations, which allow them to achieve cost-effectiveness, and swift response in their organizational process. They help agile organizations improve their customers' loyalty and satisfaction [12]. Digital platforms are considered as an important element of the Industry 4.0 infrastructure. To better understand the impact of digital platforms on an organizations' agility, it is important to consider the role of human capital and organizational capital in this context [12].

Human capital refers to the collective capabilities of an organization's employees to solve problems and to better connect with customers and suppliers. Organizational capital consists of all the resources of non-human knowledge. Digital platforms capability may improve OA by bolstering human capital.

Digital technologies can enhance the efficiency of the workforce in completing different organizational tasks as well as improving the decision-making process. DP promotes the human capital to respond to dynamic situations quickly using their abilities, skills and knowledge. Logically, organization with strong human capital may attain better agility. Additionally, organizational capital is influential for attaining organizational agility. Digital platform can boost organizational capital by improving the effectiveness of information transfer systems. A high organizational capital harness better the organizations' resources, which induces a higher agility.

Developing digital platforms can also provide flexibility which is still a priority in many firms. Digital platforms enable firms to deploy new ways to respond to market opportunities, by increasing their resources' flexibility. They can operate as magnifiers that boost other coordinating efforts within and across firm borders. Furthermore, the use of digital assets, reduces the firm's reliance on physical assets, e.g. machinery, and enhance the performance of existing physical assets, which in turn can help limiting costly downtime [28].

Furthermore, digital technologies have changed the way firms function by enabling unparalleled access to massive volumes of data created by diverse sources, e.g. client interactions, operational procedures. This data may be evaluated using modern analytic techniques like machine learning and artificial intelligence. This will help acquire useful insights that can be utilized to support the decision-making and gain competitive advantages. Moreover, digital technologies enable firms to collect data in real time, allowing them to respond rapidly to market developments, new trends, and client needs. This real-time data may also be used to monitor the performance of various business operations, detect bottlenecks and inefficiencies, and take corrective action before they have a negative influence on overall performance. In a nutshell, digital platforms exhibit the potential of changing the whole power structure and relationships among industry actors toward more agility [29]. On the other side, companies allow digital platforms to extensively gather business data, making them the owners of perfect knowledge of the market. This may result, if not properly regulated, in risks for opportunistic behaviours and unfair competition, which could hinder the correct spread of digital platforms.

Digital platform can boost the role of blockchains and vice versa [30]. Digital platforms are able to support a high level of traceability and visibility along the supply chains. On the other side, blockchains are able to support the digital integration in complicated supply chain.

7 Conclusion

This analysis of the literature has offered an overview of digital platforms, including their benefits, challenges and link to agility. Yet, the absence of a precise definition of digital platforms, as well as their dynamic nature and scoping issues, provide substantial obstacles to scholars and practitioners in the field. Furthermore, the lack of financial incentives for small and medium-sized firms to invest in smart technologies impedes their deployment.

The dynamic nature of digital platforms and the lack of theories that consider their specific architecture and context, makes it difficult to accurately study and analyse their

adoption. Other types of challenges are related to the process of defining the scope of study when conducting a research on digital platforms. These might be vertical or horizontal scoping issues [29], i.e. determining the proper degree of the technical architecture, and selecting which application area should be included in the research of digital platforms, respectively.

Future research should focus on defining explicit definitions and theories that account for the architecture and context of digital platforms. Furthermore, it would be interesting to address technical and technological elements of establishing digital platforms, such as security, privacy, and interoperability. There is also a need to study economic and societal impacts of digital platforms, such as how they affect employment, productivity, and innovation. Lastly, future studies could also focus on the organizational and administrative issues that arise while building digital platforms, such as governance, ownership, and coordination.

In general, overcoming these issues and research gaps will be crucial for furthering our understanding of digital platforms and their potential to revolutionize business sectors and societies.

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References

1. Zhou, K., Liu, T., Zhou, L.: Industry 4.0: towards future industrial opportunities and challenges. In: 12th International Conference on Fuzzy Systems and Knowledge Discovery Proceedings, pp. 2147–2152 (2015)
2. Oztemel, E., Gursev, S.: Literature review of industry 4.0 and related technologies. J. Intel. Manuf. **31**, 127–182 (2020)
3. Lu, Y.: Industry 4.0: a survey on technologies, applications and open research issues. J. Ind. Inf. Integr. **6**, 1–10 (2017)
4. Zhong, R.Y., Xu, X., Klotz, E., et al.: Intelligent manufacturing in the context of industry 4.0: a review. Engineering **3**(5), 616–630 (2017)
5. Schneider, P.: Managerial challenges of Industry 4.0: an empirically backed research agenda for a nascent field. Rev. Manag. Sci. **12**, 803–848 (2018)
6. Kiel, D., Arnold, C., Voigt, K.-I.: The influence of the industrial internet of things on business models of established manufacturing companies – a business level perspective. Technovation **68**, 4–19 (2017)
7. Cenamor, J., Rönnberg, S.D., Parida, V.: Adopting a platform approach in servitization: leveraging the value of digitalization. Int. J. Prod. Econ. **192**, 54–65 (2017)
8. Cenamor, J., Parida, V., Wincent, J.: How entrepreneurial SMEs compete through digital platforms: the roles of digital platform capability, network capability and ambidexterity. J. Bus. Res. **100**, 196–206 (2019)
9. Veile, J.W., Schmidt, M.C., Voigt, K.I.: Toward a new era of cooperation: how industrial digital platforms transform business models in industry 4.0. J. Bus. Res. **143**, 387–405 (2022)
10. Evans, D. S., Schmalensee, R.: Matchmakers: The New Economics of Multisided Platforms. Harvard Business Review Press, Brighton (2016)
11. Gawer, A.: Digital platforms' boundaries: the interplay of firm scope, platform sides, and digital interfaces. Long Range Plan. (in press) **54**(5), 102045 (2021)

12. Ahmed, A., Bhatti, S.H., Ismail, G., et al.: Digital platform capability and organizational agility of emerging market manufacturing SMEs: the mediating role of intellectual capital and the moderating role of environmental dynamism. Technol. Forecast. Soc. Change **177**, 121513 (2022)
13. Kazan, E., Tan, C.-W., Lim, E.T.K., Sørensen, C., Damsgaard, J.: Disentangling digital platform competition: the case of UK mobile payment platforms. J. Manag. Inf. Syst. **35**(1), 180–219 (2018)
14. Brynjolfsson, E., McAfee, A.: The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies. WW Norton & Company, New York (2014)
15. Parida, V., Örtqvist, D.: Interactive effects of network capability, ICT capability, and financial slack on technology-based small firm innovation performance. J. Small Bus. Manag. **53**, 278–298 (2015)
16. Sharif, S.P., Mura, P., Wijesinghe, S.N.R.: Systematic reviews in Asia: introducing the "PRISMA" protocol to tourism and hospitality scholars. In: Rezaei, S. (eds.) Quantitative Tourism Research in Asia. Perspectives on Asian Tourism. Springer, Singapore (2019). https://doi.org/10.1007/978-981-13-2463-5_2
17. Haddara, M., Elragal, A.: The readiness of ERP systems for the factory of the future. Procedia Comput. Sci. **64**, 721–728 (2015)
18. Jahanmir, S.F., Cavadas, J.: Factors affecting late adoption of digital innovations. J. Bus. Res. **88**, 337–343 (2018)
19. Parker, G., Van Alstyne, M., Choudary, S.P.: Platform Revolution: How Networked Markets are Transforming the Economy and How to Make them Work for You, 1st ed. W. W. Norton & Company, New York (2016)
20. Camarinha-Matos, L.M., Fornasiero, R., Afsarmanesh, H.: Collaborative networks as a core enabler of industry 4.0. In: Camarinha-Matos, L., Afsarmanesh, H., Fornasiero, R. (eds.) Collaboration in a Data-Rich World. PRO-VE 2017. IFIP AICT, vol. 506, pp. 3–17. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-65151-4_1
21. Yeow, A., Soh, C., Hansen, R.: Aligning with new digital strategy: a dynamic capabilities approach. J. Strateg. Inf. Syst. **27**(1), 43–58 (2018)
22. Digital Platforms in Manufacturing Industries Report (2021). https://www.plattform-i40.de/IP/Redaktion/DE/Downloads/Publikation/digital-platforms-in-manufacturing-2021.pdf?__blob=publicationFile&v=9. Accessed 01 Mar 2023
23. Aslam, S., Emmanuel, P.: Formulating a researchable question: a critical step for facilitating good clinical research. Indian J. Sex. Transm. Dis. AIDS **31**(1), 47 (2010)
24. Waclawovsky, G., Pedralli, M.L., Eibel, B., Schaun, M.II, Lehnen, A.M.: Effects of different types of exercise training on endothelial function in prehypertensive and hypertensive individuals: a systematic review. Arq. Bras. Cardiol. **116**(5), 938–47 (2021)
25. Liberati, A., Altman, D.G., Tetzlaff, J., et al.: The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. Ann. Intern. Med. **151**(4), W-65 (2009)
26. Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., PRISMA Group*, T.: Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann. Intern. Med. **151**, 264–269 (2009)
27. Grangel-González, L., Halilaj, G.C., et al.: Towards a semantic administrative shell for industry 4.0 components. In: 2016 IEEE Tenth International Conference on Semantic Computing (ICSC), pp. 230–237, Laguna Hills, USA (2016)
28. Ravichandran, T.: Exploring the relationships between IT competence, innovation capacity and organizational agility. J. Strateg. Inf. Syst. **27**(1), 22–42 (2018)

29. De Reuver, M., Sørensen, C., Basole, R.C.: The digital platform: a research agenda. J. Inf. Technol. **33**(2), 124–135 (2018)
30. Moretto, A., Macchion, L.: Drivers, barriers and supply chain variables influencing the adoption of the blockchain to support traceability along fashion supply chains. Oper. Manag. Res. **15**, 1470–1489 (2022)