Jidoka advancements and applications for empowering manufacturing and operations: a bibliometric review

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Abstract: The advent of Industry 4.0 (I4.0) alongside the evolution of new digital technologies and software has ignited a burgeoning interest in the advancements and applications of Jidoka within manufacturing contexts and operations. Jidoka, a principle of the Toyota Production System (also known as autonomation), emphasizes process automation with a human touch. Specifically, Jidoka enables machines to detect abnormalities and stop operations, empowering workers to prevent waste and defects, promptly fix issues, and investigate their causes. Consequently, Jidoka fosters operational excellence and sustainable development within companies, which are currently prominent areas of focus. Despite the recent interest in Jidoka and the availability of I4.0 technologies and software to facilitate its implementation, the literature in this field remains relatively scant. Indeed, few studies have delved into the application of autonomation in manufacturing and operations environments, with attention often shifted towards exploring other Lean practices (e.g., 5S, Kanban, SMED, etc.). Furthermore, a comprehensive analysis of the existing literature on Jidoka is missing, leaving researchers and practitioners without a consolidated overview of influential studies and authors in this domain. Such an overview could serve as a catalyst for inspiring new advancements and applications of autonomation both in academic research and practical company settings. To bridge this gap, this paper presents a bibliometric review conducted using a Systematic Literature Network Analysis (SLNA) on the advancements and applications of Jidoka in manufacturing and operations. The proposed bibliometric review aims to shed light on the current state of research in this field, identifying key trends, influential studies, and emerging areas of interest. As a result, descriptive metrics on the retrieved papers are provided, thereby offering an overview of the existing body of knowledge and laying the groundwork for identifying potential gaps and future research directions.

Keywords: Autonomation, Lean management, Lean tools, Continuous improvement, Literature review.

1. Introduction

Due to unprecedented levels of globalization, companies are facing competitive markets with increasing customer demands for high-quality products at lower costs and faster delivery times (Dey et al., 2021). The manufacturing industry is turning to technology and digital transformation to navigate this challenging landscape, with the Industry 4.0 (I4.0) paradigm emerging as a critical success factor (Rosin et al., 2020). The advent of I4.0 and the evolution of new digital technologies and software have expanded the control capabilities of manufacturing processes, enabling real-time monitoring of various parameters and the identification of deviations from normal operating ranges (Villalba-Diez et al., 2021). In this context, the ability to monitor multiple parameters and perform data-driven analyses is fueling a growing interest in Jidoka's advances and applications in manufacturing operations. Jidoka, a principle of the Toyota Production System (also known as autonomation), underscores process automation with a human touch. Specifically, Jidoka entails equipping machines with "intelligence" through visual control systems, built-in automatic checking systems, and mistake proofing devices. This empowers machines to detect anomalies and interrupt operations, allowing workers to prevent defects, address related issues, and investigate their root causes (Garza-Reyes et al., 2018). Given the ability to avoid waste, identify inefficiencies, and devise immediate countermeasures, Jidoka is remarked as a necessary evolutionary step for raising the level of operational excellence and sustainable development within manufacturing companies (Villalba-Diez et al., 2021). Despite the potential of Jidoka and the availability of I4.0 technologies and software to facilitate its implementation, the current literature in this field is relatively scant. Few studies have delved into the Jidoka application in manufacturing environments, with attention often directed towards exploring other Lean practices (e.g., 5S, SMED, etc.) (Villalba-Diez et al., 2021). Moreover, as noted by Xiaobo and Ohno (2000), previous literature has focused on autonomation as a concept loosely associated with autonomous defect control. However, adopting Jidoka within manufacturing companies offers broader promises, enabling enhancements not only in quality control but also in production operations, inventory management, and supply chain management. Consequently, this lack of knowledge prevents Jidoka application in real companies, hindering the operational excellence and sustainability of the industrial fabric. In this context, grasping an overview of the existing literature on Jidoka within manufacturing contexts could provide the following contributions. First, to organize and consolidate the research conducted so far by identifying the key works and the most prolific authors, journals, and countries in this field. Second, to define current and future research trends and gaps, establishing a foundation for future research endeavors while also providing practitioners with insights for implementing Jidoka in their companies. Accordingly, an overview of the existing literature on Jidoka could serve as a catalyst for inspiring new advancements and applications of autonomation both in academic and practical settings. However, to the best of the authors' knowledge, an overview of the research on Jidoka is yet to be found in the literature, along with a bibliometric review on this topic. To bridge this gap, this paper presents a bibliometric review conducted using a Systematic Literature Network Analysis (SLNA) on the advancements and applications of Jidoka. The aim of this bibliometric review is to shed light on the current state of research on Jidoka, identifying key trends, influential studies, and emerging areas of interest by answering two research questions: *(RQ1) What are the most productive and influential countries, journals, and authors, and the most influential contributions in the Jidoka literature? (RQ2) What are the key research strands that mainly concur in developing the Jidoka literature?* Accordingly, this paper has three objectives. First, to uncover the existing Jidoka literature. Second, to scrutinize the top countries, journals, authors, and papers contributing to this field by analyzing their descriptive metrics regarding publications and citations, thereby providing an overview of the current knowledge. Finally, to examine past and ongoing research strands pertaining to Jidoka by analyzing the co-occurrence of authors' keywords, thus laying the groundwork for future research directions. The remainder of this paper is as follows: Section 2 describes the materials collected through SLNA and the methodology followed to conduct the bibliometric review. Section 3 presents the bibliometric results. Finally, Section 4 offers concluding remarks.

2. Materials and methodology

2.1 Materials

The SLNA was carried out on February 20, 2024, using the Scopus database to search for scientific contributions. Scopus was chosen since it has been described as the best search engine in terms of scientific journal coverage (Das and Tyagi, 1997). The following search query was devised to interrogate Scopus, identifying papers mentioning Jidoka and its synonym autonomation in the title, abstract, or keywords: *TITLE-ABS-KEY (jidoka OR autonomation)*. This search query yielded 190 documents. The idea behind this paper was to search for applications of Jidoka in manufacturing contexts and operations. However, given the limited number of contributions retrieved (190 without any exclusion criteria applied), it was deemed appropriate not to narrow the search by adding keywords such as "manufacturing" OR "operations" in the query. This decision aimed to maintain the breadth of results, avoiding losing relevant documents on the topic of interest. The initial set of 190 documents underwent filtering based on the following exclusion criteria (EXs), summarized in Fig. 1. To capture all existing contributions in the analyzed domain, no restrictions were placed on the papers' publication dates. Instead, subject areas unrelated to the research topic were excluded (i.e., Material Science, Energy, Earth and Planetary Sciences, Social Sciences, Medicine, Physics and Astronomy, Chemical Engineering, Chemistry, Agricultural and Biological Sciences, Biochemistry Genetics and Molecular Biology, Health Professions, Pharmacology Toxicology and Pharmaceutics, and Nursing). This filtering process resulted in 119 contributions. Subsequently, only Articles and Conference Papers were retained, narrowing down the selection to 108 documents. Next, documents written in English were filtered, resulting in 103 contributions. Finally, duplicates were removed, achieving 102 papers. The resulting database was extracted from Scopus in a .csv file and used to develop the bibliometric review.

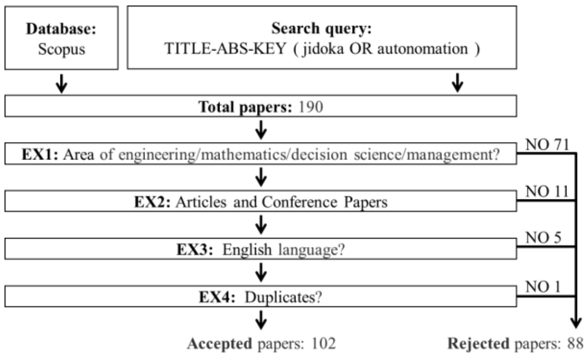

Fig. 1. SLNA performed to achieve the analyzed database

2.2 Methodology

A bibliometric analysis was conducted in this work, exploring the current research on Jidoka. To answer RQ1, we first examined the publications and citations of each of the 102 contributions in Fig.1. Following Strozzi et al. (2017), this examination allowed to determine the most productive and influential countries, journals, and authors in the field. Secondly, we identified the most productive authors, countries, and journals, being those that have produced the highest number of publications on Jidoka. This analysis allowed us to remark on the primary sources to be consulted when aiming to explore the Jidoka topic. Thirdly, we defined the most influential (i.e., most cited) authors, countries, and journals in this field, thereby pinpointing the literature contributions deemed most noteworthy by other researchers. Finally, to conclude answering RQ1, the authors' characteristics and influential papers in the domain of analysis were summarized and validated by providing the graphical tool 'QARA' introduced by Cantini et al. (2022). Whereas to answer RQ2, we conducted a co-word network analysis, as suggested by Callon et al. (1991). This analysis allowed investigating the main themes associated with the Jidoka topic. Specifically, the co-occurrence of authors' keywords was examined to uncover prevalent research strands and emerging areas of interest. In terms of the software used to carry out this bibliometric review, three tools were used: *Microsoft Excel™, Bibliometrix* (an *R*-tool), and *VOSviewer*. *Microsoft Excel™* and *Bibliometrix* were allies in elaborating statistics regarding publications and citations of countries, journals, and authors (addressing RQ1). Meanwhile, both *Bibliometrix* and *VOSviewer* were used to analyze authors' keywords (addressing RQ2).

3. Results and discussion

Applying the methodology of Section 2 to the database of 102 papers yielded the following results. The database comprises 102 documents, of which 50 Articles and 52 Conference Papers. These contributions originate from 301 authors across 81 journals over a time span of 38 years (1986-2024). On average, each document garners 17.6 citations, while the total number of citations per year is depicted in Fig. 2 (orange), juxtaposed with the annual distribution of publications (blue).

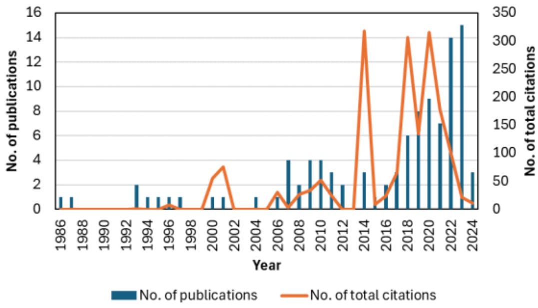

Fig 2. Reference publication (blue) and citation (orange) year spectroscopy

In Fig. 2, the first two papers published correspond to initial research of Auburn University dated back to 1986-1987. These papers introduced the autonomation concept by proposing an unmanned robotic cell for automatically fabricating goods and implementing automated quality controls (Black, 1986; Black and Schroer, 1987). This result aligns with the insights provided by Villalba-Diez et al. (2021), who reported that the concept of Jidoka emerged in the late 1980s under the guidance of Taiichi Ohno within the context of Lean Manufacturing and the Toyota Production System (Ohno, 1988). Although Fig. 2 indicates 1986 as the initial publication date for papers on Jidoka, there are no other publications (aside from the two by Auburn University) before 1993. More broadly, while the concept of Jidoka has been recognized for nearly 40 years, scholarly output remained limited until 2007, which appears to mark the actual beginning of this research stream. This is evident from Fig. 2, where the trend of publications and citations over time proves a significant turning point in 2007 (i.e., the average annual publication rate was 0.6 papers/year before 2007, compared to 5 papers/year after 2007). The publication trend has exhibited a notable increase over the past decade, as shown in Fig. 2. This indicates a rising interest in Jidoka among the scientific community. Particularly, a surge in publications is evident in the last 3 years since the blue histograms reach a peak in 2023. Notably, Fig. 2 reflects only 3 articles published in 2024; however, this can be attributed to the timing of the search query that has been conducted in February 2024. Consequently, it is reasonable to expect a substantial uptick in publications by the end of 2024. Furthermore, Fig. 2 reveals three prominent peaks in the citation curve (orange) during 2014, 2018, and 2020, respectively. This suggests the emergence of significant contributions during those years.

3.1 Publication and citation analysis

To answer RQ1, the first step involved examining the geographical distribution of publications and citations to identify the most productive and influential countries in the Jidoka field. Fig. 3 illustrates the productivity of countries based on their total number of publications. Darker shades are attributed to India, the United States, and China, which means that these are the most productive countries with 34, 28, and 25 publications, respectively. Additionally, Fig. 3 underscores the global participation in research advancement in the analyzed field, with contributions from all continents, albeit a majority originating from North and South America (86 out of 102 documents). In terms of citations, the United Kingdom, France, and Korea stand out as the most influential countries, boasting 560, 229, and 184 citations, respectively. A comparison between the most productive and most influential countries reveals that no single country leads in both aspects. While productivity is notable in America and Asia, influence seems more concentrated in Europe and Asia. These results emphasize that countries with a high volume of publications do not always generate scientific contributions that garner the highest interest from the scientific community. Therefore, it is crucial not to confine bibliometric analyses to the sole investigation of the most productive countries but also encompass less prolific nations. This consideration has been taken into account in this study, explaining why for countries (but also for authors and journals) we have analyzed both the most productive and the most influential resources in the Jidoka domain.

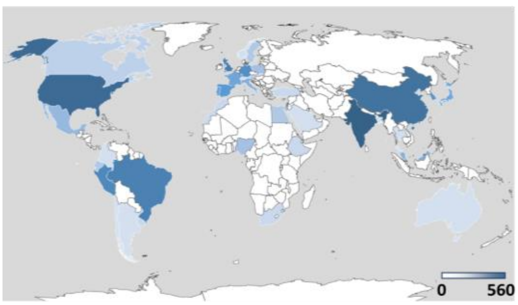

Fig. 3. No. of publications per country

After focusing on countries, we moved to define the most productive and influential journals on Jidoka. To identify the most productive sources, Bradford's Law was applied (Bradford, 1976). According to this Law, if journals publishing papers on Jidoka are arranged in descending order of publications, successive zones of journals containing an equivalent number of papers will form a geometric series $1\!:\!n\!:\!n^2\!:\!n^3\!:\ldots$. Based on this, we could identify 12 core sources (out of 81 journals) that can be considered the most productive ones, collectively encompassing one-third (33.3%) of the publications on Jidoka. These 12 journals are shown in Fig. 4, being included within the grey rectangle: Int. J. of Prod. Res. (IJPR, 6 publications), ACM Int. Conf. Proc. Series (ICPS, 4 publications), Lect. Notes Netw. Syst. (3 publications), Mathematics (3 publications), SAE Technical Papers (3 publications), Comp. and Ind. Eng. (CAIE, 2 publications), IFAC-Papersonline (2 publications), Int. J. of Product. Perf. Manag. (2 publications), Procedia Manufacturing (2 publications), Proc. Int. Conf. Ind. Eng. Oper. Manag. (2 publications), S. Afr. J. Ind. Eng. (2 publications), and TQM Journal (2 publications). To further investigate the most productive journals (i.e., mostly devoted to publish on Jidoka), the publication trend of the top 5 core sources was depicted (Fig. 5). IJPR demonstrated a sustained interest in Jidoka, persistently publishing on this topic since 2019. ICPS, Mathematics, and Lect. Notes Newt. Syst. exhibited recent engagement with Jidoka, having published all respective papers within the last 5 years. Conversely, SAE Technical Papers revealed a waning interest on Jidoka, having ceased any publication activity on Jidoka after the late 1900s.

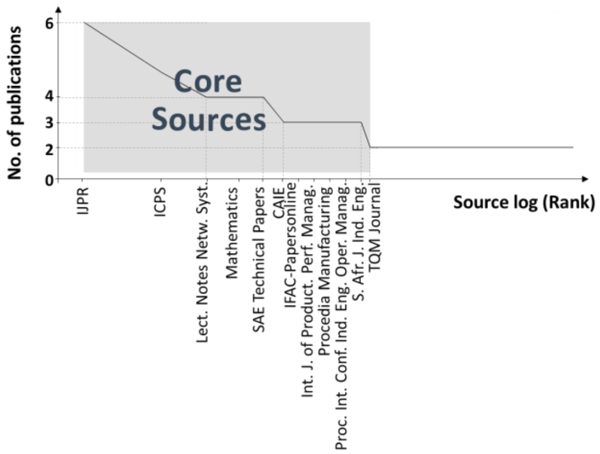

Fig. 4. Most productive journals based on Bradford's law

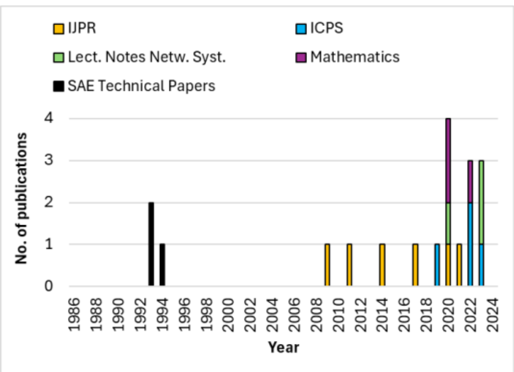

Fig. 5. Publication trend of top 5 core sources

After identifying the most productive journals (Fig. 4-5), the most influential ones were determined by analyzing their average number of Citations Per Publication (CPP), which is calculated by dividing the total number of citations and publications of each journal (Eq. 1).

$$CPP = \frac{No.of\ citations}{No.of\ publications} \qquad (1)$$

By ranking journals in descending order of CPP, the top 5 most influential sources (with the highest CPP) were delineated (Tab. 1), namely: the International Journal of Production Economics (IJPE), IJPR, IEE Transactions (Institute of Industrial Engineers), the European Journal of Operational Research (EJOR), and the Journal of Modelling in Management (J. Model. Manag.). Notably, only 1 of the top 5 core journals in Fig. 5 (i.e., IJPR) is also included in Tab. 1. This result underscores the importance of investigating both the quantity of documents published by journals (productivity) and their citation counts (influence). As a matter of fact, quantity does not invariably equate to quality, as noteworthy papers on Jidoka have not necessarily been published by the top 5 core sources. Another significant finding emerges in Tab. 1, which further answers RQ1. Notably, the CPP ranking not only highlights the most influential journals but also the most influential papers in the field of Jidoka. For instance, the paper by (Garza-Reyes et al., 2018) published in IJPE stands out as particularly noteworthy within the scientific community, accumulating 175 citations over 7 years (thereby affirming the citation peak observed in Fig. 2).

Tab. 1. Top 5 most influential journals

Source (with references)	No. of publications	No. of citations	CPP
IJPE (Garza-Reyes et al., 2018)	1	175	175
IJPR (Dey et al., 2021), (Rosin et al., 2020), (Andreadis et al., 2017), (Belekoukias et al., 2014), (Tamura et al., 2011), (Gong et al., 2009)	6	667	111
IIE Transactions (Miltenburg, 2001)	1	76	76
EJOR (Xiaobo and Ohno, 2000)	1	55	55
J. Model. Manag. (Abideen and Mohamad, 2021)	1	40	40

To conclude the investigation of RQ1, the most productive and influential authors and papers in the realm of Jidoka were identified by developing a 'Qualitative Authors' Relevance Assessment (QARA)' graph. QARA is a visual descriptive tool introduced by Cantini et al. (2022). It outlines key information on authors' productivity and influence based on their number of publications and CPP, while also highlighting their most influential papers. Within the QARA, each author's annual publication is represented by a dot. The dots' size can be small, medium, or large depending on the number of papers published annually by each author (1, 2, or 3, respectively). Whereas the dots' color follows a chromatic scale that depends on the total number of citations received by each paper annually (ranging from dark blue for 1 citation to dark red for 10 citations). Additionally, authors' names are arranged on the y-axis in descending order of CPP, so that their influence is highlighted. Herein, for the sake of brevity, the QARA illustrates only the top 15 authors in terms of CPP (Fig. 6). However, the graph could be easily extended to all authors.

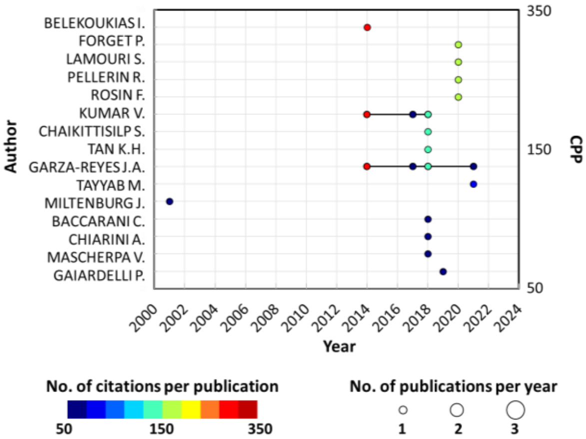

Fig. 6. QARA graph

The QARA in Fig. 6 yields several insights crucial for addressing RQ1. Firstly, the most productive authors on Jidoka appear based on the total number of publications (reflected in both the number and size of dots). Specifically, Garza-Reyes J.A. emerges as the most productive author, with 4 publications over 7 years. Secondly, by showing the distribution and size of dots, the QARA provides a visual representation of the temporal publication trend of each author, their publication frequency, and the date of their initial publication. Accordingly, Fig. 6 proves that publications within the Jidoka domain are few and sporadic. As a matter of fact, although this topic has been known since 1986, the current literature lacks consistent engagement of researchers, as evidenced by only 2 authors (Kumar V. and Garza-Reyes J.A.) who have published more than 1 paper on Jidoka throughout their careers. Moreover, since all dots are small, Fig. 6 indicates that no author has published more than 1 paper per year. Thirdly, the QARA highlights the most influential authors on Jidoka by ranking them based on their CPPs. In this regard, Belekoukias appears as the author with the highest CPP (y-axis), boasting a value of 304. Notably, the most productive author on Jidoka differs from the most influential one, which further remarks the importance of examining both metrics (i.e., number of publications and citations). Furthermore, it's noteworthy that the minimum number of citations received by papers in Fig. 6 exceeds 50 (as specified for dark blue dots in the legend). This significant number of citations demonstrates that, despite the limited literature available on Jidoka, the existing documents attract considerable attention from the scientific community. Lastly, the QARA allows for identifying the most influential papers within the Jidoka literature, which are represented by the red dots. In particular, Fig. 6 illustrates 3 red dots, all corresponding to the same paper (Belekoukias et al., 2014), which boasts 304 citations. This paper demonstrates that Jidoka is among the most powerful Lean tools to significantly improve the operational performance of manufacturing companies. Following red dots, other influent papers in Fig. 6 are denoted by green dots. These dots correspond to the paper by Rosin et al. (2020), which has garnered 214 citations. This study underscores the robust backing for I4.0 technologies in the context of Jidoka, illustrating how strongly the integration of I4.0 and autonomation can drive economic growth and sustainable development in manufacturing companies. Given that both red and green dots (representing the most influential papers on Jidoka) focus on manufacturing companies (although the keyword "manufacturing" or "operations" was not mentioned in the search query in Fig. 1), this finding highlights a research strand that ripe for more exploration: the implementation of autonomation concepts and approaches (eventually bolstered by I4.0 technologies), to facilitate the operational excellence and sustainability of manufacturing companies.

3.2 Co-word network analysis

To tackle RQ2, the key research strands concerning the Jidoka literature were explored by analyzing the co-occurrence of authors' keywords using *VOSviewer*. Fig. 7 shows the findings, illustrating the links between keywords that have a minimum number of co-occurrences of 2. To build Fig. 7 fractional counting was used for weighting keywords (i.e., if an author has co-authored a document with 3 other colleagues, each of the 3 co-authorship links was weighted as 1/3). Moreover, a thesaurus was established to avoid considering as separate keywords the synonyms and acronyms. The results in Fig. 7 suggest that the Jidoka literature can be clustered into 7 research strands (one per each color). Each strand has been validated by reading the abstracts of the 102 papers. Blue is the research strand concerning the proposal of Jidoka and lean tools (e.g., 5s and poka-yoke) to standardize company processes and apply lean management. An example of paper belonging to this strand is (Miltenburg, 2001). Orange refers to Jidoka as a strategy to activate kaizen processes, thereby allowing continuous improvement and just-in-time in companies. (Tamura et al., 2011) is an example of work in this strand. Green is about the successful combination of Jidoka with other lean tools (e.g., value stream mapping or total productive maintenance) to improve the performance of companies and supply chains, as shown, for example, by Belekoukias et al. (2014). Azure regards the adoption of Jidoka to enhance safety management and lean construction, as shown for example in (Saurin et al., 2008). Red refers to the integration between Jidoka approaches, I4.0 technologies and Artificial Intelligence (where advanced analytics and I4.0 facilitate the integration of Jidoka in companies). An example of paper in this strand is (Demircioglu et al., 2024). Yellow concerns Jidoka as a way to pursue autonomation and cooperation between humans and robots, achieving smart production and inventory systems. An example of paper belonging to this strand is (Dey et al., 2021). Finally, purple regards Jidoka as a strategy to achieve greater sustainability and waste reduction in companies, as shown by Rosin et al. (2020).

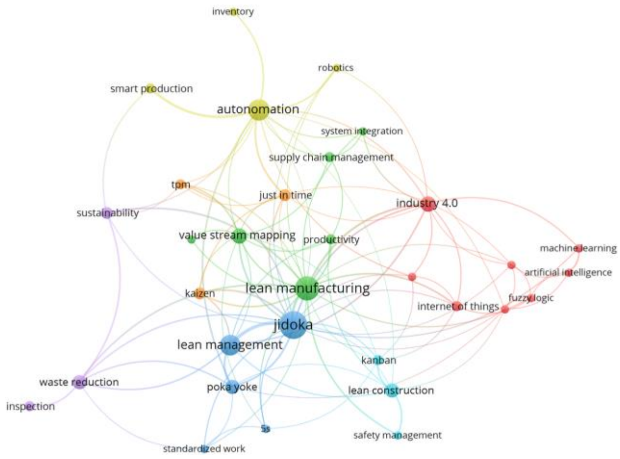

Fig. 7. Co-occurrence of authors' keywords

Alongside mapping the co-occurrence of authors' keywords, to delve deeper RQ2 and explore the key research strands on Jidoka, *Bibliometrix* was leveraged. A Thematic Map of authors' keywords was built following Cobo et al. (2011) and integrating the thesaurus provided in Tab. 2. The resulting Thematic Map is depicted in Fig. 8., delineating the main research strands investigated on Jidoka and categorizing them as 'Basic', 'Motor', 'Emerging or Declining', and 'Niche Themes'. 'Basic Themes' encompass well-established research strands in the Jidoka domain. Among the 7 research strands identified in Fig. 7, Fig. 8 designates as Basic Themes the blue, green, and azure ones. Particularly, Fig. 8 includes among Basic Themes: (i) Jidoka itself and its association with I4.0 paradigms; (ii) the combination of Jidoka with other lean tools (e.g., value stream mapping and total productive maintenance) to foster lean manufacturing and lean management practices; (iii) Jidoka's role in optimizing supply chain management and productivity; and (iv) Jidoka as a strategy to facilitate lean construction, building information modeling (BIM), and enhanced quality. Moreover, among the 7 research strands emerged in Fig. 7, Fig. 8 highlights the red one as a 'Motor Theme'. Specifically, Fig. 8 indicates that the integration of Jidoka approaches with Artificial Intelligence is a driving research strand that mainly concur in developing the literature in this field. Other noteworthy Motor Themes in Fig. 8 include exploring Jidoka as an enabler of the Internet of Things, and the adoption of Jidoka to improve inventory management. Additionally, Fig. 8 identifies the 'Emerging or Declining Themes', comprising the orange research strand mentioned in Fig. 7. Indeed, Fig. 8 denotes as themes with substantial room for further exploration the investigations on Jidoka approaches as allies for initiating kaizen processes and facilitating company inspections. Notably, both Motor and Emerging Themes show potential for further investigation and may inspire future research challenges, favouring the advancement of Jidoka literature. Furthermore, Fig. 8 indicates the azure research strand from Fig. 7 as a 'Niche Theme', meaning that this research strand is explored by specific authors targeting specific market sectors and readerships. Particularly, Fig. 8 stresses as Niche Themes the adoption of Jidoka to: (i) enhance safety management; (ii) pursue cooperation between humans and robots; (iii) achieve smart production; (iv) and implement lean practices in real-world settings. Concerning lean implementation, Fig. 8 prompts a reflection: while numerous theoretical and conceptual studies exist on the capabilities of Jidoka in conjunction with other lean tools, practical applications of these concepts in real-world companies seem scarcely proposed (lean implementation is a Niche Theme). Finally, Fig 8. provides an additional finding. All strands of Fig. 7 are included in Fig.8 except one. Notably, Fig. 8 does not feature Jidoka as a catalyst for achieving greater sustainability and waste reduction in companies, which is depicted as the purple research strand in Fig. 7. This outcome, derived from the analysis of author's keywords, suggests that the literature in this research strand is not mature and holds potential for future development.

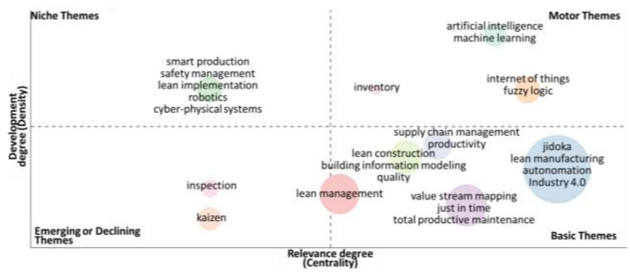

Fig. 8. Thematic Map of authors' keywords

4. Conclusions

This work provides a bibliometric review on the Jidoka literature. Through an SLNA and a detailed exploration of publication and citation metrics within the Jidoka domain, the most productive and influential countries, journals, authors, and contributions in this field are identified (addressing RQ1 and remarking the distinction between productivity and influence performance). Moreover, the key research strands associated with the Jidoka domain are determined by analyzing the co-occurrence of authors' keywords (which aids in answering RQ2). Consequently, the driving research strands that mainly contribute to advancing the literature on Jidoka are defined, shedding light on specific themes that could inspire future research opportunities. The results of this study demonstrate that, despite nearly 40 years since the inception of the autonomation topic, the literature on Jidoka remains limited (especially before 2007). However, there has been a notable increase in attention to this topic in recent years. Upon delving into existing studies, current advancements in Jidoka literature appear to be driven by 3 Motor Themes: (a) integrating Jidoka approaches with Artificial Intelligence; (b) exploring Jidoka as a catalyst for the Internet of Things; and (c) adopting Jidoka to optimize inventory management. On the other hand, 2 research strands show potential for further exploration: (d) employing Jidoka for initiating kaizen processes and facilitating company inspections; and (e) utilizing Jidoka to enhance companies' sustainability and reduce waste. In addition to the aforementioned inventory applications, the QARA graph presented in this paper has unveiled another promising area for the Jidoka successful implementation: the manufacturing companies, where autonomation (eventually bolstered by I4.0 technologies) seems crucial to facilitate operational excellence. The main contributions of this study are two. At a theoretical level, this study delineates the characteristics of the existing body of knowledge on Jidoka, allowing researchers to pinpointing literature gaps and uncovering new research opportunities. At a practical level, this work outlines current and future trends in the Jidoka application, offering practitioners valuable insights for implementing autonomation in their companies and realizing the associated operational and sustainability benefits. Instead, the limitations of this study are associated with utilizing only the Scopus database to collect scientific contributions for developing the bibliometric review. Accordingly, future developments of this study could be two. First, to incorporate other databases alongside Scopus to validate or broaden the bibliometric review. Second, to amalgamate this bibliometric analysis with a more exhaustive literature review. This would involve scrutinizing the full-text of all 102 papers, filtering out any irrelevant contributions through title and abstract examination, and categorizing the remaining papers based on multiple criteria and perspectives.

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