“Scoping research on sustainability performance from manufacturing industry sector”

AUTHORS	Ismail Hussien Droup Adam Ahmad Jusoh https://orcid.org/0000-0002-7172-8416 Abbas Mardani Dalia Streimikiene Khalil Md Nor

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Ismail Hussien Droup Adam, Azman Hashim International Business School, Universiti Teknologi Malaysia, Malaysia.

Ahmad Jusoh, Dr., Associate Professor, Azman Hashim International Business School, Universiti Teknologi Malaysia, Malaysia.

Abbas Mardani, Senior Lecturer, Azman Hashim International Business School, Universiti Teknologi Malaysia, Malaysia.

Dalia Streimikiene, Ph.D., Professor, Lithuanian Institute of Agrarian Economics, Lithuania.

Khalil Md Nor, Professor, Azman Hashim International Business School, Universiti Teknologi Malaysia, Malaysia.

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Ismail Hussien Droup Adam (Malaysia), **Ahmad Jusoh** (Malaysia), **Abbas Mardani** (Malaysia), **Dalia Streimikiene** (Lithuania), **Khalil Md Nor** (Malaysia)

SCOPING RESEARCH ON SUSTAINABILITY PERFORMANCE FROM MANUFACTURING INDUSTRY SECTOR

Abstract

Sustainability is a key area of concern for manufacturing firms' long-term success. However, the manufacturing industry has not been fully conscious of the potential sustainable values across manufacturing system. There is a need to better understand how companies can improve sustainable value creation. Recent research and practices have shown that sustainable operations can be one way to create sustainable values (e.g. economic, environmental and social). This review article focuses on the available empirical studies on the impact of lean and sustainability practices on sustainable performance from 2000 to 2018 in the context of manufacturing firms. Integrating lean and sustainability practices into manufacturing system confronты operations managers with paradoxical tensions of sustainability objectives. Theoretically having paradoxical mindset will help firms' managers make sense of and responв to such paradoxical tensions. In the context of sustainable operations studies, the issue of paradoxical mindset has been given less emphasis. Therefore, through the lens of the paradox theory, this study has developed a new conceptual framework for future research to investigate how paradoxical mindset moderates the impact of lean and sustainability practices on the sustainable performance of manufacturing industry. This study may add to the understanding of the circumstances, under which lean and sustainability practices impact sustainable outcomes.

Keywords sustainability performance, economic performance, social performance, manufacturing firms

JEL Classification Q56, Q010, L60, L25, M11

INTRODUCTION

The world over, program and activities are at feverish pitch to address the increasing challenges associated with the simultaneous management of the triple (economic, environment, and social) bottom line, which emerged as a concern on the consequences of humanity's resource footprints (Liang et al., 2018). This concern is well matched by the increasingly large corpus of research on the question of sustainability, a development which motivated researchers to produce a significant volume of research syntheses, based on systematic and analytic methods (Cooper, 2017; Rajnoha & Lesníková, 2016, Marikina, 2018). However, most of these syntheses portray heavily skewed results in favor of non-African contexts not because of methodological shortcomings, but for the simple fact that research on sustainability in seven manufactures in Africa is scanty. To substantiate this point, we conducted a restrictive title-only Scopus search for manufacturing sustainability performance in November 2018. As a result, 1,640 documents for the 19-year period 2000–2018 were returned. This indicates that sustainability research in manufacturing sector is still in its infancy, and any attempt at synthesizing manufacturing sustainability empirical studies should be guided by a synthesis method that purposely targets relevant documents. Scoping review is one of the

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methods. Scoping searches seek "to identify all relevant literature, to provide a broad overview of the topic, and to identify research gaps in the existing literature" (Franciosi et al., 2018, pp. 903-904). In this review, therefore, we apply the scoping review to map out research on the determinants of sustainability performance within the context of manufacturing industry in relation to the extant perception of researchers on what constitutes sustainability performance, the nature of the common criterion of interest in the field, its antecedents and relations to the triple bottom line and business case approach dominant in the received literature.

1. SCOPING REVIEW AND RESEARCH

According to Colquhoun et al. (2014), scoping review "addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area" (pp. 1292, 1294). Similarly, Armstrong et al. (2011) conceptualize scoping review as a credible procedure for exploring fragmentary and minimally resourced knowledge domains, identifying parameters of interest in the literature, and integrating these in a logical manner to improve meaning and unravel implications. Scoping review as a method of knowledge synthesis has arguably come of age. It has certainly matured in the health research field (e.g., Larjow, 2018; Ports et al., 2019; Senanayake et al., 2018), where it all started due to the Cochrane connection (CCEPP, 1996). This health connection evidenced by the result of November 2014 title search (scoping review, health) of a 5-year span (2014–2018) from a single content provider (ScienceDirect) returning 214 scoping review articles in which only a few are non-health related. It is therefore time to upscale the use of scoping review in areas where it is little used, such as sustainability research. Brisbois et al. (2018) is a cognate boundary-spanning example, while Moore et al.'s (2017) work untangles the sustainability definitional maze. This study takes a cue from and builds on these collectively pioneering works.

2. METHODOLOGY

We adapted the scoping review method originally advanced in Arksey and O'Malley (2005), as later improved and elaborated in Levac, Colquhoun, and O'Brien (2010), and finally recommended in Colquhoun et al. (2014). The scoping procedure is a five-step heuristic involving the following: identifying the research question, identifying relevant studies, study selection, charting the data, and collating, summarizing results and reporting the rezults. Figure 1 illustrates the process followed gathering evidence for this review.

2.1. Scoping horizon

Our scoping review covered the period from January 2000 to mid-November 2018. This timespan was chosen, because, according to Elkington (2004), the man who coined the term "triple bot-

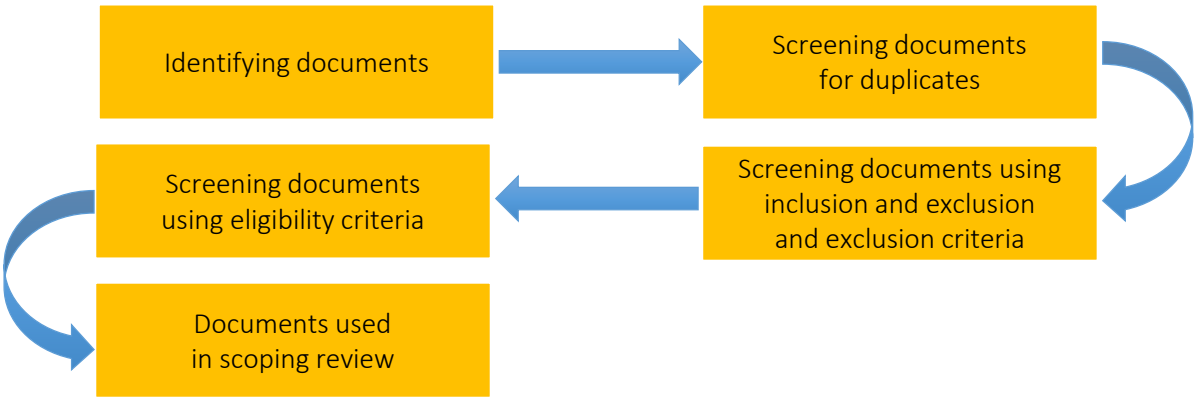

Figure 1. Scoping review process

Table 1. Inclusion and exclusion criteria used in the scoping searches

Inclusion criteria	Exclusion criteria
• Papers on manufacturing industry • Must be an empirical study • Must be an antecedent of sustainability performance • Must be from business management field • Written in the English language • From 2000–2018 time span period	• Papers from non-manufacturing context • Literature reviews • Conceptual • Books

tom line" in 1994, research on sustainability related to the term took off just around the turn of the new millennium. Studies published before the turn of this millennium were not that significant, especially those coming from the manufacturing industry.

2.2. Study selection

Our scoping search was carried out exclusively within the Scopus database. At least three reasons underpin this decision. First, Scopus is the largest repository of peer reviewed content and only a negligible portion of it is in non-English language (Salisu & Awang, 2018). Second, the content of the next candidate database, the Web of Science (WOS), significantly overlaps with the Scopus content. In fact, a search for "sustainability manufacturing" limited to content originated from the seven countries of Northern Africa failed to return any document unique to the WOS. Thus, relying solely on the Scopus database do not detract the fidelity of our conclusions based on feared errors that may arise due to an unlikely omission of key documents that hypothetically may exist on the WOS. Third, the absence of quality assessment for included documents in scoping reviews has been noted as a flaw (Daudt, van Mossel, & Scott, 2013), but our reliance on premium content database like Scopus may hopefully ameliorate this apparent drawback, more especially considering the scantiness of the sources reviewed.

Our scoping search was based on the search strings shown in Table 1. The search output for the first five search strings was combined as sustainability performance after screening out duplications using the Mendeley bibliographic software. The initial search output for each search string was progressively filtered using year of publication (2000–2018), country of document type (articles, articles in press, chapters in books, and conference proceedings). As a result, there are 1,640 documents in all.

2.3. Eligibility criteria

We utilized the inclusion and exclusion criteria in sifting the 1,273 documents based on whether they address any of the issues on sustainability performance within the context of manufacturing industry. The inclusion criteria represent the characteristics a document must necessarily possess to be relevant to this scoping review, while the exclusion criteria are additional features found in an otherwise relevant document, which disqualify it from being included in the review (Patino & Ferreira, 2018). Table 1 shows the inclusion and exclusion criteria of the screening documents usage for this scoping review.

The eligibility criteria listed in Table A1 (see Appendix A) to the 1,640 documents led to the exclusion of 1,528, leaving us with a final sample of 112 documents.

The journals are listed in Figure 2, the most important journals identified are Journal of Cleaner Production (Q1), Journal of Production Economics (Q1), International Journal of Operations & Production Management (Q2).

3. DEFINITIONS

In management literature, the firm's performance has been limited to economic performance (Haddach, Ammari, & Laglaoui, 2016). The economic aspect includes: profit, return on assets, economic value added (Fauzi, Svensson, & Rahman, 2010). Recently the survival of firms never again depends exclusively on the economical related side of their operation, yet additionally how they carry on those operations (Haddach et al., 2016). Therefore, the economic focus performance is not well appropriate to manage the firm issue in a holistic manner (Hart & Milstein, 2003). Accordingly, the firm's obligations are emerging,

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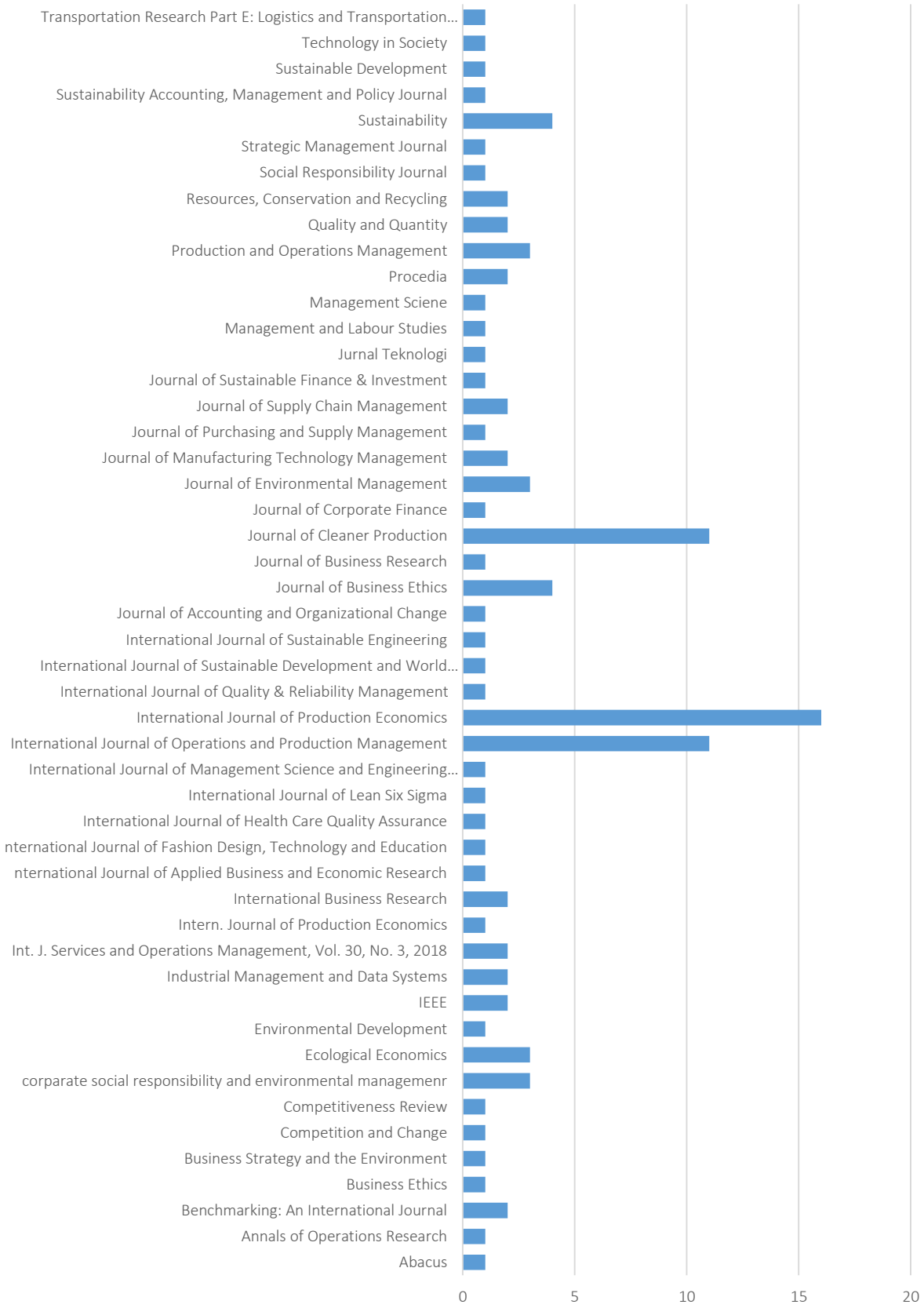

Figure 2. The distributions of journal publications

Figure 3. Sustainability antecedents distributions

it's never again restricted just to include direct shareholders, but integrates different stakeholders (Haddach et al., 2016). The term firm performance has extended to incorporate, in addition to the economic aspect, social and environmental dimension. Along these lines, the expanded firm performance, commonly called sustainable performance (Fauzi et al., 2010; G. Karnitis & E. Karnitis, 2017). Sustainability performance "measures the extent to which a firm embraces economic, environmental, social and governance factors into its operations, and ultimately the impact they exert on the firm and society" (Artiach, Lee, Nelson, & Walker, 2010). This definition is fit with the triple bottom lines of the firm's sustainability, economic, social, and environmental performance. Within the context of manufacturing industry, sustainability performance is defined as the extent to which the manufacturing firms have reduced its harm and produced regenerative impacts on natural and social systems.

4. SUSTAINABILITY PERFORMANCE ANTECEDENTS AND DETERMINANTS

The identification of sustainability performance determinant shows the factors illustrated in Figure 3, the which reported the dominant determinant factors (with 66 papers) of sustainability performance in terms of lean manufacturing practices, environmental management, green supply chain, sustainable manufacturing practices, after excluding the miner factors (46 articles). Thus, these factors expected to have the biggest influence on sustainability outcomes for the industrial manufacturing context. In addition, for the purpose of our study, these antecedents are described as the sustainable operations and analyzed in terms of relation to sustainability performance.

DISCUSSIONS AND CONCLUSION

Based on our scoping literature, we observed that most of the previous studies were mainly conducted in developed and developing countries, using single or across the countries. With respect to single countries, the United States, China, Malaysia, UK, Turkey, Taiwan, US, Indonesia, India and Brazil took

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the lead in the studies conducted (see Figure 4). However, none of the selected studies were found to be conducted in countries such as Africa. These are very essential inquiries perceiving how manufacturing industry in Africa has always contributed significantly to carbon emissions, resources duplication, and environmental degradation (Chambers, 1992). Moreover, African countries are also characterized with the high level of holding inventories, low productive workforce, low operations capacity (Dafa' Alla, 2016). If African countries would like to avoid these consequences while pursuing the next global manufacturing hub to maintain a manufacturing development, a cleaner path must be outlined. This implies that from the starting point of manufacturing development, the discussion on continent should include, sustainable operations in manufacturing industry (Chambers, 1992; Mukhtarova et al., 2016). We call research on sustainable operations management to fill this gap, taking this the advantage of this opportunity. Future research can examine how the sustainable operations influence sustainability performance in countries such as African countries.

Regarding the influence of the sustainable operations on the sustainability performance, the results are inconsistent, in order to understand the reasons due to inconsistency, we utilized the method of Van der Byl and Slawinski (2015) who categorized three sustainability approaches which have been used by researchers and practitioners for responding to sustainability challenges: trade off, business case, and triple bottom line; in trade off, one or two dimensions of sustainability were selected over another; within the business approaches, the focus was on the economic, profit and shareholders; the triple bottom line emphasizes the three dimensions of sustainability, namely economic, environmental and social. Accordingly, in our paper, we identified and selected the studies that focused on one of the dimensions of sustainability performance as trade off approach; the selected studies that focused on economic dimension of sustainability, defined as business case approaches, finally, the triple bottom line studies are those which addressed the economic, environmental and social sustainability (Gao & Bansal, 2013; Eslami et al., 2018; Petkeviciute & Streimikiene, 2017).

Based on the selected studies results, about 63% of the trade off approach results support positive influence of sustainable operations on sustainability performance (Antomarioni, Bevilacqua, & Ciarapica, 2018; Bulgacov, Ometto, & May, 2015; Camuffo, De Stefano, & Paolino, 2017; Fu, Guo, & Zhanwen, 2017; Gotschol, Giovanni, & Esposito, 2014; Hajmohammad, Vachon, Klassen, & Gavronski, 2013; Hong, Roh, & Rawski, 2012; King & Lenox, 2001; Sambasivan, Bah, & Ho, 2013; Yang, Lu, Jing, & Bernard, 2013; Zhan, Tan, Ji, Chung, & Chiu, 2018). Other groups of selected studies which focused on business case approaches shows about 63 of the results are significant (Nawanir, Lim, & Othman, 2016; Sezen, Karakadilar, & Buyukozkan, 2012; Charles et al., 2017; López-Gamero, Molina-Azorín, & Claver-

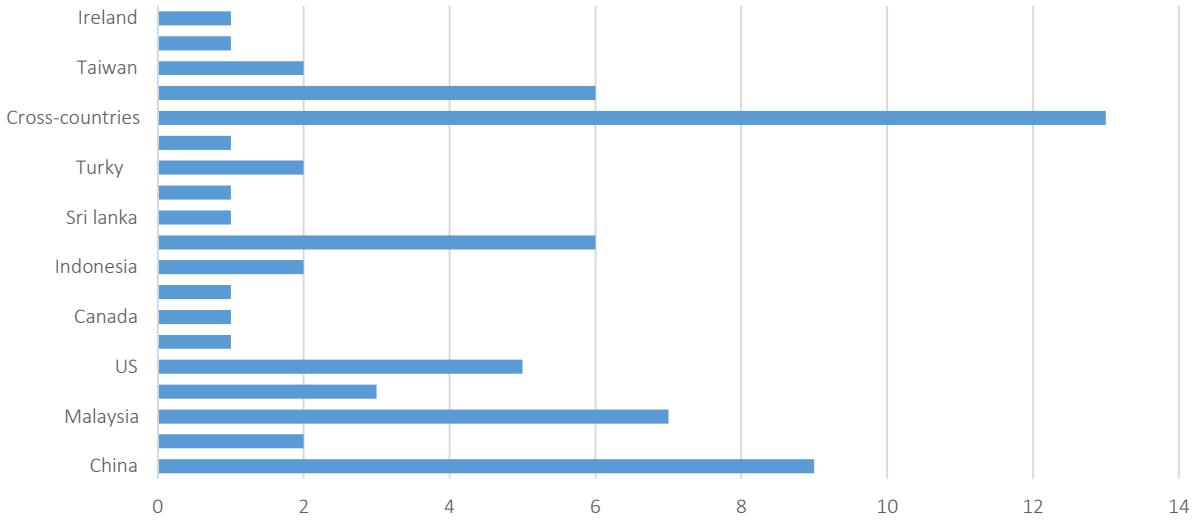

Figure 4. Country context

Cortés, 2009; Gotschol et al., 2014; V. Wickramasinghe & G. Wickramasinghe, 2017; Lewis, 2000; Hofer, Eroglu, & Rossiter Hofer, 2012; Chavez et al., 2015; Kim, Sheu, & Yoon, 2018). However, a few of selected studies consider the sustainability performance according to triple bottom line approach, and 85% the studies supported positive rezults (Abdul-Rashid, Sakundarini, Raja Ghazilla, & Thurasamy, 2017; Azevedo, Carvalho, Duarte, & Cruz-Machado, 2012; de Giovanni, 2012; Gadenne et al., 2012; Sandeep Gupta, Shivam Gupta, Dhamija, & Bag, 2018; Haddach et al., 2016; Longoni & Cagliano, 2015; Sajan, Shalij, Ramesh, & Biju Augustine, 2017; Sambasivan et al., 2013; Sezen & Çankaya, 2013; Wijethilake, 2017; Wu et al., 2015; Yang et al., 2013).

With the compression of three approaches of sustainability performance, we observed that triple bottom line approach tends to be more superior to the trade off, and business case approaches, the logic is that to be truly sustainable, firms shouldn't harm natural or human systems while creating economic value for its stockholders over an extended period (Gao & Bansal, 2013). Hence, the better results from triple bottom line approaches reflect how managers of these firms are successfully managing conflicting objectives of economic, environmental and social goals. In contrast, the articles that shows negative results reflect how manufacturing industry fails to respond to the conflicting sustainability objectives. This can be due to lack of abilities on how managers they can integrate the objectives of sustainability and find innovative solutions, how managers are approaching sustainability performance is still not fully understood (Van der Byl & Slawinski, 2015). Thus, we call future empirical research on the sustainable operations of manufacturing industry for conducting the studies on how operations managers are addressing the conflicting demands of sustainability in terms of productivity versus environmental concern and employees wellbeing.

Considering the managerial level at which respondents are selected (see Figure 6), the review unveils that most of the studies conducted on the context of respondents from top or strategic level (i.e. top managers, President, CEO, senior manager, executives), as well as managers from multi-level; at the strategic level, the sustainability focus is more about the firms' stakeholder relationship, considering

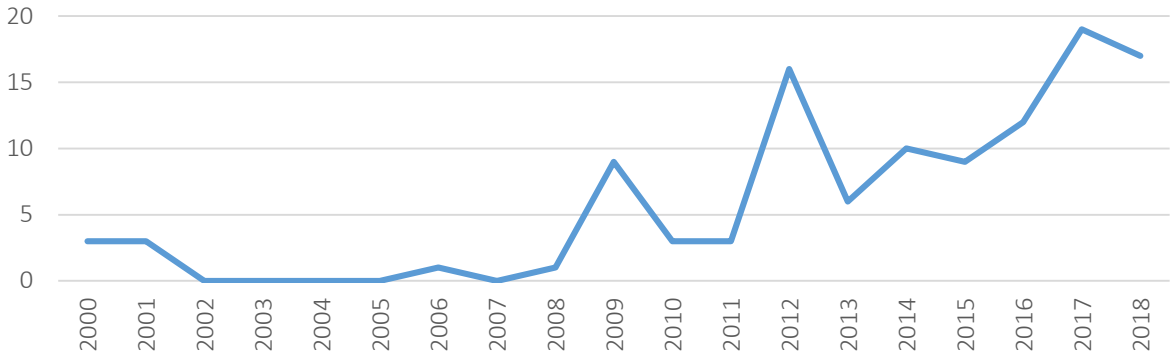

Figure 5. Research trend

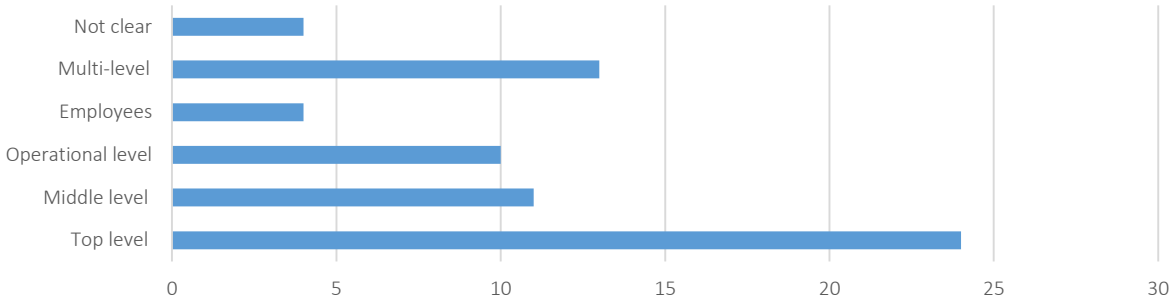

Figure 6. Respondents managerial level context

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their requirements and communicating the way in which their expectations are addressed (Asif, Searcy, Zutshi, & Ahmad, 2011). However, there are few studies that investigate sustainability at the tactical and operational level, in which the adaptation deals with the aspect of designing organizational structures, policies, and processes, as well as a system for their evaluation; moreover, at the operational level, the concern is about implementation of tasks, followed by monitoring and evaluation (Asif et al., 2011). The fitting among firms objectives and activities at operational level is necessary, since the work alternatives create confusion for workers and ineffective and inefficient use of resources (Asif et al., 2011). We call future research sustainable operation management for concentrating their studies on operational level and workers at manufacturing work due to a rise of confusing and conflicting demands of sustainability in real work practices.

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APPENDIX A

Table A1. The description of sustainability performance, antecedents, approaches, country context and managerial level

No.	Author	Antecedents	Performance	Context	Managerial level	Results	Approaches
1	Fu, Guo, and Zhanwen (2017)	Lean improvement environmental improvement	Environmental performance and lean performance	China	Not mentioned	Positive	Trade off
2	Camuffo, De Stefano, and Paolino (2017)	Lean operations	Safety (social performance)	Cross-countries	Operational level	Positive	Trade off
3	Abdul-Rashid, Sakundarini, Raja Ghazilla, and Thurasamy (2017)	Sustainable manufacturing practices	Economic, environmental and social	Malaysia	Top level	Positive results	TBL
4	Hong, Roh, and Rawski (2012)	Sustainability practices	Financial performance (economic)	Cross-countries	Operational level	Positive	Trade off
5	King and Lenox (2001)	Lean and green	Environmental performance	US	Not mentioned	Positive	Trade off
6	Azevedo, Carvalho, Duarte, and Cruz-Machado (2012)	Lean and green supply chain	Economic, environmental and social	Portugal	Operational level	No relations	TBL
7	Sajan, Shalij, Ramesh, and Biju Augustine (2017)	Lean practices	Economic, environmental and social	India	Multi-level	Positive	TBL
8	Hajmohammad, Vachon, Klassen, and Gavronski (2013)	Lean management and supply management	Environmental	Canada	Operational level	Positive results	Trade off
9	Nawanir, Lim, and Othman (2016)	Lean manufacturing practices	Business performance (economic)	Indonesia	Multi-level	Positive	Business case
10	Wijethilake (2017)	Proactive sustainability strategy	Economic, environmental and social	Cross-countries	Multi-level	Positive results	TBL
11	Gadenne et al. (2012)	Sustainability management	Sustainability performance	Australia	Top level	Positive results	TBL
12	Sezen and Çankaya (2013)	Green and eco-innovation	Economic, environmental and social	Turkey	Top level	Positive results	TBL
13	Wu et al. (2015)	Sustainability practices	Economic, environmental and social	China	Top level	Positive results	TBL
14	Sezen, Karakadilar, and Buyukozkan (2012)	Lean practices	Economic	Turkey	Top level	Positive results	Business case
15	de Giovanni (2012)	Environmental management	Economic, environmental and social	Italy	Top level	Positive	TBL
16	Gupta, Gupta, Dhamija, and Bag (2018)	Sustainability strategy	Economic, environmental and social	India	Top level	Positive	TBL
17	Yang, Lu, Jing, and Bernard (2013)	Green supply chain management	Competitiveness (economic)	Taiwan	Top level	Positive	Trade off
18	Charles, Dorion, Andrea, Cesar, Guimar, and Severo (2017)	Environmental management	Financial (economic)	Brazil	Top level	Positive	Business case
19	Bulgacov, Ometto, and May, (2015)	Sustainability practices	Stakeholder involvement (social)	Brazil	Multi-level	Positive	Trade off
20	Sambasivan, Bah, and Ho (2013)	Environmental management	Economic and social	Malaysia	Top level	Positive	Trade off

Table A1 (cont.). The description of sustainability performance, antecedents, approaches, country context and managerial level

No.	Author	Antecedents	Performance	Context	Managerial level	Results	Approaches
21	López-Gamero, Molina-Azorín, and Claver-Cortés (2009)	Cleaner production	Profitability (economic)	China	Top level	Positive	Business case
22	V. Wickramasinghe and G. Wickramasinghe (2017)	Lean production	Firms performance (economic)	Sri Lanka	Employees	Positive	Business case
23	Gotschol, Giovanni, and Esposito (2014)	Supply chain management and green production	Environmental and economic	Italy	Middle level	Positive	Trade off
24	Hofer, Eroglu, and Rossiter Hofer (2012)	Lean hard and soft tools	Financial performance	US	Middle level	Positive	Business case
25	Chavez et al. (2015)	Lean practices	Economic	Ireland	Middle level	Positive	Business case
26	Nawanir, Lim, and Othman (2016)	Lean practices	Business performance (economic)	Indonesia	Multi-level	Positive	Business case
27	Kim, Sheu, and Yoon (2018)	Environmental management	Innovation (economic)	Cross-countries	Operational level	Positive	Business case
28	Cherrafi et al. (2018)	Lean, green, innovation	Green (environmental)	Cross-countries	Multi-level	–	TBL
29	Antomarioni, Bevilacqua, and Ciarapica (2018)	Lean practices	Environmental and economical	Italy	Not clear	Positive results	Trade off
30	Antomarioni et al. (2018)	Sustainability business practices	Environmental, economic and social	Cross-countries	Top level	Positive results	TBL

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