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Multi-perspective view on sustainable production: A literature review

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Abstract: Manufactured products should be produced in a sustainable way because of their immense impact on the economy, environment and society. However, due to the many diverse parties involved and their often conflicting motivations, this is usually not the case. This paper is a literature review explaining the drivers for the transition to sustainable production from different points of view by analyzing current literature. The stakeholders are classified in the following categories: Government, Corporate, Consumer, Society. Each of the stakeholder groups has a significant impact sustainable production. Governments set the field for the corporations to operate in through rules and regulations. The effectiveness of these rules and regulations depends on government awareness and proactivity. Moreover, consumers play an important role since their demand for sustainably produced goods is an important driving factor for companies. Corporations are required to adapt to governmental regulations and consumer demand, but they can also lead the way by putting into effect sustainable methods of production. Finally, it is up to society as a whole to promote sustainable production since it profoundly benefits from it.

Keywords: Literature review, Sustainable production, Multi perspective.

1 Introduction

Nowadays, manufactured products should be produced in a sustainable way due to their immense impact on the economy, environment and society [1]. This results in promotion of system innovations that aim to design out waste and increase resource-efficiency [2]. Sustainable production (SP) is defined “as production (and use) of products and services in a manner that is socially beneficial, economically viable and environmentally benign over their whole life cycle” [3]. This goes hand in hand with the triple bottom line concept that defines sustainability as the ability of a product to work continuously while ensuring lowest environmental impacts and providing economic and social benefits to stakeholders [4]-[6]. Thus, the fundamental pillars of sustainability are economic, environmental and social impact. According to Rosen and Kishawy [7] concerns regarding these pillars should be addressed “simultaneously and holistically”, meaning that focus on all aspects is necessary to achieve sustainable development.

For production to abide by the definition and concepts of sustainability, it needs to weigh and incorporate economic, environmental and social goals, policies and practices

[7]. These goals are set by different stakeholders who are impacted by production. A traditional definition of stakeholders is that they are any group of individuals who are impacted by or can influence the development of organizations' objectives [8]. However, the goal of sustainable production is not just to consider the organization, but rather an increased number of stakeholders [9], [10]. These diverse stakeholders can be categorized in the following groups:

1. **Government** –an overseeing body, by whose laws the company needs to abide to operate in that domain/market,
2. **Corporate** –the company manufacturing products, including its' management and shareholders,
3. **Consumer** –the consumer purchasing the product,
4. **Society** –the third parties impacted by production.

Each group of stakeholders has unique requirements and goals. Due to their diversity these requirements and goals often do not coincide, making it challenging to satisfy each stakeholder group. Conflicting objectives can emerge in various industries and countries, even in social enterprises created with the primary goal of positive social and environmental impact rather than profit maximization [11]. This concrete example shows how, in the agricultural cooperative in Italy, the pursuance of sustainability goals creates a financial strain, leading to the abandonment of the primary sustainability objectives. When faced with the issue of waste management members of the cooperative were forced to use more chemicals or plastic packaging, negatively impacting the local society.

Trade-offs in objectives can be noticed when governmental regulation decisions favor one stakeholder rather than the other. A model created by Zhang et al [12] deepens the effects of regulation on companies and social welfare (directly affecting the society stakeholder), finding that trade offs between higher profitability and improved social welfare are affected by the type of legislation imposed. For example, if government advocate for the use of green technologies there are limited social welfare benefits, whereas if a carbon cap and credits strategy is implemented social welfare is increased at the expense of companies' profitability.

Collaboration [11], [13] and certain trade-offs [7] are necessary and crucial. However, this is not a disadvantage, but rather an advantage used to attain the benefits of SP as they are thoroughly and methodologically defined taking every angle and point of view into consideration and ensuring diversity and balance [14]. Unlike conventional benefit creation that concerns only a select group of stakeholders, the benefits created by sustainable production are far reaching since they impact a broad group of stakeholders. Moreover, SP focuses both on the short-term and long-term, creating immediate impact and providing lasting positive effects. It satisfies the needs of current stakeholders without putting at risk the needs of future stakeholders [10]. More specifically the benefits from SP include, but are not limited to, lower costs, improved efficiency, increased revenue, internal and external customer satisfaction, increased market shares leading to better risk management [15].

This paper seeks to explain the current literatures view on sustainable production from multiple perspectives, thus explaining the reasoning and motivation behind

different drivers in a clearer way. Furthermore, each stakeholder group experiences barriers that are limiting the implementation of SP to a greater extent. Thus, this led to the following research questions: Which are the main research streams on sustainable production from the perspective of diverse stakeholders?

This paper is structured as follows. Section 2 explains the methodology used to conduct the research. Section 3 analyzes the views of different stakeholders. Section 4 concludes the discussion and suggests the potential direction for future research.

2 Research methodology

Considering the above-mentioned research question, the present work aims at exploring scientific literature to shed the light on how research on SP has developed and evolved with a specific focus on the perspective of diverse stakeholders. To answer RQ, we focus on deriving a concept list containing a definition of the term sustainable production by performing a systematic literature review [16]. Therefore, the steps of the systematic literature review used are the following:

1. **Defining the search criteria** – only literature relevant to the research question was taken into consideration. The period analyzed considers work published from 2012 to 2021 and only English language papers were taken into consideration.
2. **Selecting a data source** – the SCOPUS and Web of Science databases were selected due to its access to global scientific publications.
3. **Collection of literature by searching for key words** in the SCOPUS and Web of Science databases
 - a. The key words are: sustainable production, sustainable manufacturing, sustainable production + government, sustainable production + legislation, sustainable production + consumer, sustainable production + customer, sustainable production + third parties
4. **Analysis of the literature** by reading the title and abstract (*only the papers consistent with the research question were considered*). This filtering has led to the final set of 41 journal papers and 4 conference papers, for a total of 45 papers.
5. **Presenting the findings**

3 Research streams on sustainable production from the perspective of diverse stakeholders

Notwithstanding the apparent hype around sustainable production, there is still a lack of research and the implications for government, corporate, consumers, and society.

3.1 Government – point of view

Governments set the sustainable production “playing field” for companies through the implementation of rules and regulations, promoting SP in a number of ways depending

on their motivation and goals, which are described as drivers. However, not every government has incentive to promote SP. A distinction exists between SP practices in developed and developing countries. Global organizations whose concern is sustainability are compelling developing markets to adopt sustainable production because often less developed countries sacrifice the wellbeing of their citizens, either through a lack of environmental regulation or a lack of labor laws. Governments compromise to induce growth since corporations transfer production to these markets to avoid costly regulations of developed countries [17], [18]. Certainly, responsibility falls on corporations not to give in to temptation but rather employ SP.

Of course, positive examples exist in developing markets where government rules and regulations promote SP. Such is the case of Bangladesh which pushed the producers in the highly environmentally polluting leather industry to seek SP methods by implementing adequate regulations [18]. The motivation behind this regulatory push to obtain sustainable production was to allow Bangladesh to become more competitive in the global market [18]. Rigorous government regulation leads to improved production technology and therefore better global competitiveness [19].

Another reason governments create SP regulation is to reduce energy consumption, a prime pollutant of the environment [20]-[22]. Motivation to reduce waste and unnecessary consumption does not apply only to energy [20], [23]. A growing population leads to an increase in natural resource expenditure, in turn leading to either more governmental spending or lower quality of life. By creating rules and regulations geared towards SP governments solve these issues without compromising the quality of life for its' citizens [23]. Increased resource consumption affects international competitiveness for some countries. For example, in Malawi government legislation is crucial since the sugarcane industry on which the economy is highly dependent is being depleted due to deteriorating environmental conditions and immoderate exploitation [24].

Aside from waste reduction, global competitiveness and better life quality, a motivating factor for the push to SP from the government perspective is job creation [23].

The most effective ways governments can promote sustainable production is through legislation and incentive systems [23], [25]. Legislation by itself in some cases is not enough as proper execution is necessary for it to have an impact [19]. However, barriers exist that hinder adequate execution.

Moreover, regulation needs to be applied meticulously, with adequate research backing it. Zhu et al. [26] demonstrate how different types of policies impact firms' profit. They find that in the case of remanufacturing, specifically targeted remanufacturing subsidies promote profit, but carbon regulation can even decrease profitability. If governments seek to impose emission caps and carbon credits, corporations will adapt their production strategies accordingly. Manufacturers will either employ green technology in their production processes or seek to purchase credits [12], [27].

3.2 Corporate – point of view

Corporations are the ones who are impacted most by sustainable production since they need to change and evolve the way they operate. There are many different motivating drivers that require this transformation that will be described in this section. Mostly

drivers can be classified as the customer needs, shareholder/ investor requirements, government legislation or lower cost/ improved production.

SP is increasingly becoming a requirement from buyers [18], [28], in some cases companies fail to acknowledge this [29]. Moreover, to obtain it, strong commitment from top management is necessary [30]. Eventually implementing it will lead to enhanced customer communication, fidelity, and trustworthiness.

Operating within laws is a crucial driver for corporations [23]. Depending on the governmental policies imposed regarding sustainable production or carbon credits, corporations will make decisions based on profit and/or cost optimization [12], [27].

Lower energy consumption not only benefits the environment, but also significantly lowers costs for manufacturers. Thus, optimized energy consumption is essential to obtain SP [20], [22]. However, there are other elements, in addition to energy consumption, that need to be optimized. Lean and green initiatives provide a solution not just for energy consumption, but also waste, emission, water, and chemical management [18], [20], [31]. Overall, shifting towards sustainable methods of production can lower material cost significantly [23].

The availability of big data allows for easier implementation of SP as it provides precious insight by monitoring and tracking production, leading to improved coordination and decision making [32]. Certain approaches to production can have a profound impact on sustainability without compromising the performance of producers, leading to increased competitive advantage [33], both in terms of business performance and relative quality [34]. Approaches such as zero waste manufacturing [35], smart manufacturing [36] and cloud manufacturing [37] utilize the latest technologies and best practices to optimize production, making it more efficient while taking into considerations factors of sustainability.

The black swan event of COVID-19 has exposed the traditional methods of production and their supply chains, it is the opinion of Nandi S. et al. [38], that this will lead to more “resilient, transparent, and sustainable” supply chains using the latest technologies, such as blockchain, which will involve multiple stakeholders across the value chain and serve crucially as the foundation for sustainable production.

As it often is, increased competition leads to progress, especially intertwined with customer awareness. Thus, companies are pursuing to employ SP to outperform their competition [18].

One of the main barriers limiting sustainable production is short-termism, the dominance of short-term agendas inside corporate boardrooms [39].

3.3 Customer – point of view

One of the barriers of putting sustainable production into effect is customer perception. Consumers need to become educated and aware of the benefits of SP [29], [40]-[42]. If the proper education and awareness initiatives are taken up customer perception becomes a big advantage and something that drives SP [18], [23], [28].

Evidence that consumers value SP, suggests manufacturers should take on the responsibility to educate buyers [23], [28]. However, certain literature proposes governments should inform consumers in order to increase consumption of low carbon options

[12]. Without doubt public awareness is one of the key factors in the enactment of SP, as customers are influential concerning environmental and social issues [18].

3.4 Society – point of view

By definition society is impacted positively by sustainable production. Therefore, it is one of the crucial drivers for the wide utilization of SP. The most effective way society can achieve this goal is by creating pressure. Many organizations and associations are operating to promote sustainability and create the pressure for change [25], [30]. These organizations and associations educate and inform customers so they can make more responsible decisions [43], persuade corporations about the benefits of SP and influence governments to create more future oriented rules and legislations [18], [44].

Sustainable production has many and diverse positive impacts on employment, such as job creation, abiding by progressive labor laws, product health and safety, and guaranteeing a safe working environment [23], [45]-[48]. One such practice that has a positive impact is waste management, which creates job opportunities for local business networks and boosts economic performance [49]. Moreover, sustainable production benefits the environment through lower pollution levels and, in particular, waste management is concerned with adequate and proper disposal of hazardous materials gravely endangering the environment [49], both factors lead to healthier living conditions.

4 Conclusion

In this article, the primary aim was to explore the current state of the art of sustainable production and to provide the main implications concerning diverse stakeholders. The following conclusions can be drawn:

- Different stakeholders have different motivations for the realization of sustainable production.
- The initial phases are most effective if enacted through government awareness or customer demand, as these are the actors that can motivate production across industries and sectors within a certain market.
- Corporations are the ones that need to adapt to regulations and demand but can also lead the way by applying best practices. Therefore, it is up to corporations to put into effect sustainable methods of production.
- Society has a responsibility of promoting sustainable production since it profoundly benefits from it.

Future research can be performed by focusing on specific methods to employ sustainable production while considering multiple stakeholders.

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