Sustainability through Innovation Practices in Manufacturing Industry
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Abstract
This article studies the effect of three fundamental elements in the manufacturing sector: the degrees of innovation, innovation in production, and innovation in organizational method, on the use of production waste and the reduction in the use of resources. This research contributes to the theory of resources and capabilities and the shared value creation approach, highlighting, especially in the industrial sector, the importance of generating incremental and disruptive innovations to develop other forms of innovation that lead to less use of resources. Moreover, the need to review the use of waste as part of the intention of the manufacturing organization to have environmental sustainability practices, which allow the use of waste to manufacture products or develop new processes.

Keywords: sustainability, innovation, industry, resources

Introduction
The excessive use of resources in production systems has brought disastrous consequences for the environment, water scarcity, less fertile soils, famines, affecting the most vulnerable populations on the planet. The concern to innovate in these forms of production and the organization has become a tool to provoke concern for environmental sustainability, both from using fewer resources and production waste. Recent climate events have convincingly demonstrated that the way production processes are carried out is not sustainable in the long term. Not only because of the number of resources in use but also because of the amount of waste they generate; most industrial companies have worked to maintain high levels of productivity at a lower cost, which means systematizing through the use of technology some processes that allow the reduction of times and movements.

Methods
For this analysis, the EDIT Technological Development and Innovation Survey have been taken with data from 2017 – 2018 created by the National Administrative Department of Statistics (DANE), with a total of 33 subsectors classified according to ISIC revision 4, the selected sample was 6,284 Colombian manufacturing companies that responded to the EDIT. The analysis has been carried out with Smart PLS for structural equations.

Results and Conclusions
The degree of innovation positively affects innovation in production, which represents an essential advance for companies in the industrial sector, recognizing that both incremental innovation and radical innovation can transform their production process, thus confirming H1. The degree of innovation affects the decrease in the use of resources through innovation in production, for which H1b is confirmed.

Figure 2. Results
For its part, innovation in the organizational method is also positively affected by the degree of innovation, in this case, an incremental and radical innovation, allowing the organization to modify internal management, especially in administrative areas, thus confirming H2. Finally, although the degree of innovation has positive effects on innovation in production, in the organizational method, and the reduction of the use of resources, it does not affect the use of waste, rejecting H3. Possibly other factors associated with the economic sector, in particular, should be included, the type of waste derived from the industrial process, where it would be interesting to consider the intensive use of technology in this waste.

Table 1. Hypotheses

Introduction
However, with this intense technology, a decrease in waste is not necessarily resolved; most production processes are not cyclical. In other words, they do not take advantage of the waste to enter the production system again, in particular, for two reasons some are highly polluting, others do not have the appropriate process to be added to the production process.

Some authors have explained the relationship between the production process and the need to innovate to improve manufacturing processes that lead to environmental sustainability; some industries have chosen to reduce their emissions (Adesina, 2020), use less water (Nouri et al. 2020), or modify energy use. Then, the following model is proposed:

Figure 1. Theoretical Model

References


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