

Chapter 13

Sustainability Assessment of Organization Performance: A Review and Case Study



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Abstract The purpose of this study is improving the organization performance advancement by an efficient literature survey (ELS). The ELS is chosen after fundamentally dissecting the different kinds of writing surveys. The actual articles on sustainability assessment appearance the review—papers based are absence on sustainability assessment how to improve the performance of any organisation. The review based on two sections of sustainability assessment: first, many types of approach and process are used and second, a design for sustainability assessment. There are three pillars of sustainability assessment which is reviewed. The review shows that their search on sustainability assessment is mainly experimental using qualitative knowledge. The paper indicates the scope, approach, and areas of sustainability assessment. The main aim of this review is improving the performance in organization sector: new product development (NPD) consumer needs, financial and human sources, admin. Tool and technique-based assessments have given way to outcome-based assessment using non-financial and qualitative parameters. This paper expects to help to research scholar those who are working in this field.

Keywords Efficient literature survey · Key performance indicators · Environmental protection agency · Triple bottom-line · Approach · Ganzheitlichen Bilanzierung · New product development

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13.1 Introduction

Performance assessment is the method for assessing work and activities inside the framework about its ability, capability, productivity, and adequacy to satisfy certain targets. Various elements, like sustainable manufacturing, green manufacturing, and clean manufacturing, brought about by different specialists amid 1987–1997 [1]. Sustainability manufacturing has been utilized as corporate sustainability, business sustainability, or industrial sustainability. These may contrast in detail yet all concur that sustainability aims at satisfying economic, social, and natural objectives [2]. Manufacturing organization is currently working in not so much secure and more complex environments. This in turn centers their business and manufacturing facilities to cater for a wider range of scope of requests so as to stay focused.

The various assets—cash, power, water, buildings, air, and persons—are able to configure, produce, and convey a product. The fundamental target of a manufacturing organization is to develop and convey product to customer and the aim of improving the organization performance without the development of sustainability [3]. The arrangements aid the choice appropriate signs for the sustainability performance. General process is identified with the organization execution evaluated in terms of profitability, adaptability, responsive, and so on while organization products have a specific performance, processes, and arrangement in terms of sustainability. Sustainability approaches help to frame configuration.

Make and convey the products in a sustainable form. In this way, the three basic components of sustainability assessment are sustainability strategies, product sustainability, and process sustainability; some independent study has been done in the output sustainability [4–6].

The objective of sustainability assessment is improving the organization performance. This study is used for the metrics of the sustainability and enhancement. The organization is unable for that kind of changes, and the sustainability cannot be improved [3].

13.2 Review of Sustainability

13.2.1 Sustainability

The meaning of “sustainability” is the methodology of how natural system function remains disparate and produces everything that it needs for the ecology to remain in equal. It additionally recognizes that human civilization takes assets to continue our cutting edge lifestyle. Tools of sustainability and the pillars of sustainability assessment are used for that kind of parameters. In which the using of, the direction of expenditures the orientation of technological development, improvement and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.

For many in the field, sustainability is defined through the following interconnected domains or pillars: environment, economic and social, in which according to [7] is based on the principles of system thinking. A review of the literature is used to explore the concept “sustainable manufacturing” that applied to processes and operations in manufacturing organizations. The review of the literature enlightens the current scenario, the progress made so far, issues encountered and problems unveiled by the early adoption and implementation, what is resolved, and what still needs to be worked upon [8]. Sustainable development consists of equal local and global efforts to meet basic human needs without destroying or degrading the natural environment [9, 10]. First pillar is future generation, which emphasizes the long-time thinking associated with sustainability [11]. And other that considers sources are use and financial sustainability as two more pillars of sustainability. Therefore, sustainability is made up of three pillars: economy, society, and the environment. These principles are also informally used as profit, people and planet [12].

13.2.2 Sustainability Performance

In these days, the industrial performance metrics move from economic centric performance measure by the sustainability assessments [13–15].

Conceptual framework: Literature review based on this study is found no further improvements in TBL of sustainability performance environment, economic, and social aspect (Fig. 13.1).

The three pillars of sustainability

Economic Development: The 2005 World Summit on social development identified sustainable development goals, such as economic development, social development, and environmental protection [17]. Sustainable development consists of equality local and global efforts to fulfill basic human needs without destroying, harm full, or degrading the natural environment [9]. The question then becomes how to represent the relationship between those needs and the environment.

Social Development: The social development is the promotion of sustainable society; its positive and negative impacts on business or industry; its protection of the health of industry working person from impactful chemical, process, and release of carbon

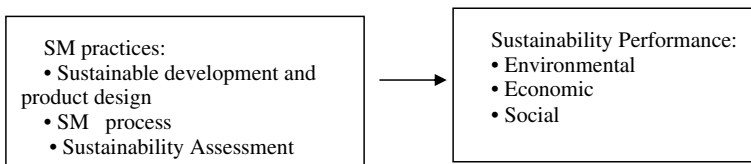
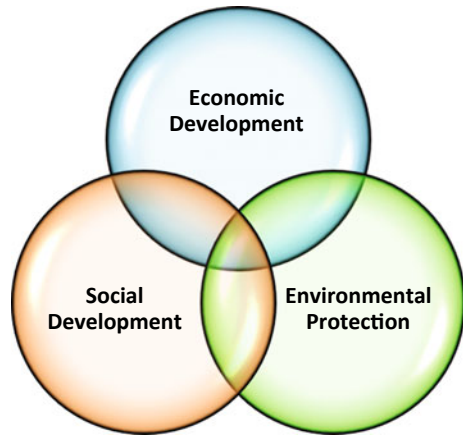


Fig. 13.1 Conceptual framework proposed in this study [16]

Fig. 13.2 Pillars of sustainability



contents. It is May about maintenance of the improving the organization performance. It means improving the revolutions of the industry like organizational performance encompasses three specific areas of firm outcomes: (a) financial performance (profits, return on assets, return on investment, etc.). The major aspect of the social development in any organization is making the sustainable house and how to design a better manner. The last thing is that qualification is to join the people with environmentally and eco-friendly sustainability and thought him about the impact on human life as well as environment.

Environmental Protection: Nowadays, we know what we need to do to protect the environment, which is reducing and recycling our power consumption by switching electronic devices off and uses standby mode. Business is coordinated to prevent pollution and remains that their own carbon emission is low. Environmental protection is the third pillar and to many, the firstly concern of the further of humanity. In the environmental protection it is described the quality of air, purification and resource of sustainability are used and centered those element who are impact to the environment. It is aimed at maintaining (and recovering when necessary) a healthy natural environment. Sustainable development embraces environmental, social and economic objectives, to deliver long-term equitable growth which benefits current and future generations. The environmental protection agency is to develop the biotechnology for the source of sustainability, protect the environment, and make the green future (Fig. 13.2).

13.3 Methodology

This research is to describe the performance related to the Indian manufacturing industries which developed the sustainability. The some participating manufacturing industries in this research were electrical, automobile and electronics, machinery

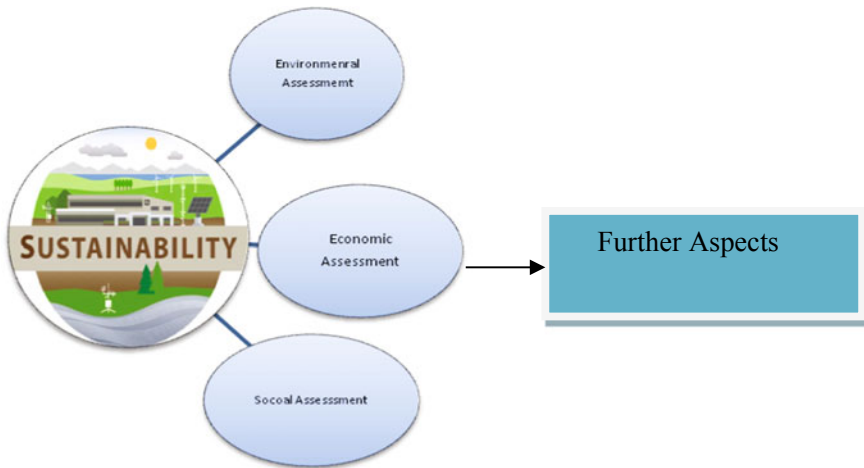


Fig. 13.3 Sustainability assessment

and process industries. The research methodology is based on the literature review through a focus of study which is cross-sectional and described the research problem that was selected based on gap identified in the literatures.

The keywords that are used in the literature review are sustainability, sustainability manufacturing, organizations, manufacturing practices, green production, assessments, and many more. The database is obtained from various types of journal, publications, thesis, and Internet sources (Fig. 13.3).

For the sustainability assessment of organization, performance is taken as an example of small-scale industries like cement, mines and mineral, manufacturing, chemical, steel, chemical, corporate (Table 13.1).

13.4 Case Study

The study was based on the small-skilled corrugated box manufacturing firm. The study was based on the “gate-to-gate”-based study. Increasing trend in Indian paper-board usage and environmental consciousness, many individuals or organizations look closely at environmental characteristics. The main aim of this research is finding the environmental potential analysis throughout the lifecycle assessment of the corrugated box producing, used, disposal in India, and further, we are trying to improve suggestion to reduce the environmental burden by using lifecycle assessment. The production stage of the packaging system is reported to be the principal cause for the major impacts. Increasing recycling rates and reducing weight in the primary package are environmentally more efficient [18, 19].

The cardboard was invented by the Chinese in 1600. The first commercial cardboard invention was created in 1817. American Robert Gair produced the first really

Table 13.1 Literature reviews for sustainability assessment performances an organization based on different types of approaches and methodologies

S. No	Key findings	Techniques	References
1.	A few investigations of process level of manufacturing, thinking about every one of the three parts of sustainability. Placed on triple bottom-line pointers, the sustainability grade determined and development methodologies were classified	VSM-based study	[22]
2.	The research was based on a car manufacturing work cell. The environment and economic assessments are done in this study. For environment, the GHG emission focused and the study on gate-to-gate process	Sustainability cone	[23]
3.	In this paper, the level of sustainability assessment was done by taking the three pillars of sustainability. This study was easy and showing the quick result. This paper provides the full description in analysis in different phases in overall analysis-based	Index-based technique	[24]
4.	The sustainability performance is done in this paper at the enterprise level by using expert approach. The study was based on three aspects of sustainability; this paper produces only single process unit and not to be compared to each individual process	Fuzzy logic	[25]
5.	In this paper, the organization-level sustainability assessment was studied. The three indicators of SM are used. The all over organization data are used in improving the organization performance	Fuzzy multi-criteria method	[26]
6.	In this paper, the sustainability assessment is having the multiple manufacturing processes; this is considered as the heating instrument by using the three pillars of sustainability manufacturing process. The literature review: it was improving the process levels and environmental potentials	Analytical hierarchy process (AHP)	[27]

(continued)

Table 13.1 (continued)

S. No	Key findings	Techniques	References
7.	This paper is to improve the each and every process machine and its environmental performance. The study was based on machining process point of view. It performs a simple term of sustainability perspectives; it performs impact assessment by using some indicators of SM	Unit process-based	[28]
8.	This study of metal-forming unit process: it is useful in research which compares the manufacturing machinery in the form of sustainability performance including the economic and environmental indicators and the study that done is not performed in the organization performance; it is not saved the cost of the product and energy of the manufacturing process	Compared-based	[29]
9.	It was based on the three pillars of sustainability manufacturing, and the level of organization assessment was done in this category. The firm was overall sustainability index and was estimated in the form of assessment factors	A holistic sustainability index-based measurement	[30]
10.	In this study, the three pillars of sustainability manufacturing. In the overall analysis, the info was provided and collected from the branch. The overall impact performance was viewed in this study	Value evaluation and sustainability assessment	[31]
11.	This study is aimed to reduce and optimize the cost and time to make a sustainable. The three aspects of sustainability under taken and overall sustainability impact are looked in this study	Model based on analytical technique	[32]
12.	This study provides the earliest assessments with very lack of details. This study is also based on the three indicators of sustainability	Rapid assessment and holistic approach	[33]

(continued)

Table 13.1 (continued)

S. No	Key findings	Techniques	References
13.	This study is calculating the sustainability's. The focus of the study was to analysis the sustainability's basis and the details of each unit are compromise. The stuffing unit development was not considered in this study when assessments	Weighted fuzzy approach	[34]

efficient cardboard box in 1879s. Since then, cardboard boxes have been widely appreciated for being strong, light, inexpensive, and recyclable.

Cardboard boxes were popular for their strength, durability, lightness, recyclability, and cost-effectiveness.

Corrugated boxes are used for shipping variety of items.

Thousands of small-skilled industries are making this product.

Corrugated boxes are sustainable product, easy to customize, and reusable.

To avoid the plastics and polythene-packaging bags, after the ban on plastic packaging product, the corrugated box is widely used.

Corrugated Box: The corrugated box plays an important role in the packaging industry. The box is made by the paperboard corrugated which is having the contents of the air and row columns. The columns make the flutes stronger than average cardboard with the air acting as a cushion for any items inside of them. The ridges inside offer flexibility and strength, as usually intended in packaging. These boxes are known to be eco-friendly because they are biodegradable and made of recycled boxes and reused.

The main purpose of this project is to find the environmental impacts analysis by throughout the lifecycle assessment of the corrugated box producing, used, disposal in India; in this research the case study is based on the corrugated product it is all about the cardboard products. Further, we are trying for the improvement options for reducing the environmental impacts by using lifecycle assessment (LCA) (Fig. 13.4).

Methodology used for this case study: The lifecycle assessment method is used for this case study work. This methodology is used to classify the environmental impact of the one unit product throughout its lifecycle “gate-to-gate”. In LCA approach, the first aim is to find the corrugated box system boundary and the second aim is to classify the data input and outputs of each and all stages of the lifecycle (resources use, energy use, raw material use, waste generation, water and air emission). The goal of this work finds impact on environment. The biggest important data relevant to corrugated box manufacturing was possessed from semi-skilled medium size factory with individual process. The GaBi 8.7 was used for optimization and data process is to calculate and compile all process which used and analyzed the emission to the environmental impact on one piece of corrugated box. gate-to-gate is one value-added



Fig. 13.4 Corrugated boxes

process in the whole manufacturing process; gate-to-gate section may be linked in their appropriate manufacturing to form a entire cradle-to-gate assessment. As a result of these efforts, consensus has been achieved on an overall LCA framework and a well-defined inventory methodology.

The four phases of LCA methodology

Goal and Scope Definition—where the study’s primary goals are described in the system’s functional units and limits. The functional unit is a representative element of the studying scheme and is the foundation on which to calculate all inputs and outputs. The inputs and outputs to be taken into account rely on the specified limit (Fig. 13.5).

Inventory Analysis or Lifecycle Inventory (LCI)—consists of calculating/collecting all the material/energy flows and procedures required for the functional unit. The materials and procedures to be regarded rely on the objectives and system boundaries identified in the preceding step.



Fig. 13.5 Phases of LCA methodology

Impact Assessment or Lifecycle Impact Assessment (LCIA)—where the effect of the inventory listed in the previous phase is assessed on the environment. Using characterization variables, inventory values are transformed to midpoint level using characterization factors. These midpoint categories can be aggregated into fewer damage categories (endpoint categories) depending on the LCIA technique used. Different LCIA techniques will take into account varying categories of midpoints and endpoints. A normalization factor can then be used to normalize the endpoint categories. The standardized outcomes can be multiplied by a weighting factor (allocated based on their relative significance to each effect category) and the weighted outcomes can be added to calculate a single score.

Results Interpretation—It consists of evaluating and interpreting the outcomes of the three preceding steps in order to recognize the system hotspots being studied and propose feasible changes. Analysis of Pareto can be used to define categories of critical effect. It not includes the transport of resource supplies, supply of beer containers, waste treatment, shipping, and recovery from the market and estimated only CO₂ emission. In the case study and the results of applying the LCA methodology to this research in further steps.

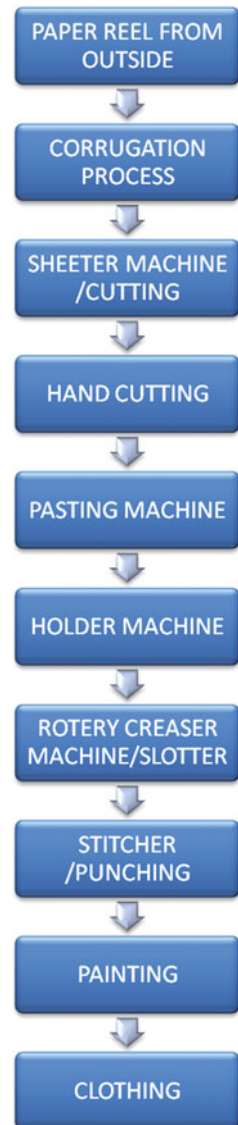
- First of all, it decides the product for doing the lifecycle assessment study and after that go for selecting the company to done the project work.
- After selecting the company, it analyzes all process and makes the flowchart for each and every process.
- Then it collects the data for each and every steps of the process which is done for the production of corrugated box.
- After collecting the data, it calculates the actual data for the development of model on software.
- The LCA model was created using the GaBi 8.7 Educational Version Software System for lifecycle assessment and developed by the PE international. The database that contained in the GaBi Software provides the lifecycle inventory (LCI) data for the raw and process material used in the background system.
- Then the result obtained from GaBi analyzed impact categories, which are harmful for the environment.

Flow Diagrams of Process and Machine

In this study, the sustainability tool “lifecycle assessment” is used. In other words, the paper includes the manufacture of corrugated box transport, processing in covers those steps. In the system boundary the process diagram is to express the adhering is joint process and the pasting of flutes layer by layer of the paper and the cutting operation of jointed fluting then slot cutting is the cut the different dimensions to add in the corrugated box for shaping then in and stitching and panting and clothing operation [20]. The outcome was performed lifecycle assessment by using International Reference Lifecycle Database ILCD recommendation in the GaBi 8.7. This tool consists of eleven impact categories, and these are global warming, acidification human toxicity cancer, human toxicity non-cancer smog formation, ozone layer depletion, etc. This study research is performed the impact assessment of the environment. The ILCD

method is generally used and analyzed the impact product manufacturing process [21] (Fig. 13.6).

Fig. 13.6 Manufacturing process



13.5 Results

The results obtain from GaBi (Version 8.7) show the environmental impact of each stages of corrugated box. The credit impact was obtained from input and output processes. The impact resources were adhesives, electricity, paper, lubricants, and steel wire in this gate-to-gate analysis.

That is production phase, in this phase, the impacts on environment are very low. The GaBi is having an own database for each and every process. The result from the organization of International Lifecycle database is used to calculate the environmental impact, and the charts of all potentials show the impact of resources and flows are used in the production of the corrugated box (Table 13.2).

In Table 13.2, the four colures are shown the impact amount in the environment. The **red color** is showing the major impact on the process of all eleven environmental potential according to ILCD database. The **green color** is showing the low impact on

Table 13.2 Impact data of corrugated box production case study

Impact Potentials	Total	Electricity	DE Wire	steel	Electricity Grid	Lubricants
Gwp	1.87	1.83	0		0.023	0.011
Human Toxic	2.48E-09	2.35E-09	0		2.90E-9	9.20E-9
Acidification	0.267	0.263	0		0.003	0.001
Ozone Deplation	3.36E-12	3.32E-12	2.00E-12		4.10E-12	1.00E-12
EP Marine	0.028	0.027	0		0	0
Water	1.49	1.52	-0.0045		0.018	-0.008
Territorial Ep	0.31	0.3	0		0	0
Ionizing Human Heath	0.21	0.2	0		0	0
Particular Mater	0.0304	0.03	0		0	0
Chemical ozone Formation	0.086	0.085	0		0.01	0
Eco Tox Human	1.91	1.85	0		0.2	0.03
Toxic	1.42E-07	1.39E-07			1.70E-07	0

environmental impacts. Yellow color is showing the medium category impact, and light green is very low amount of impact category.

13.6 Conclusions

This review shows the ELS of reviewed conference and journal articles on sustainability manufacturing to understand the various kinds of approaches and subjects. The ELS combine three phases: economic, environmental, and. In total, 45–50 paper is studying for these findings. Papers were based on the studies on three aspects of sustainability manufacturing. They are as used sustainable assessment, sustainability in manufacturing, sustainability in organization, sustainability in supply chain, sustainability in product development, sustainable in. In the case study, LCA technology in sustainability manufacturing is important to appraise environmental impacts and defense of the production phase. In the study, the lifecycle of corrugated box is having of many processes. The main source of environmental impacts is land filling, and electricity consuming having a more impact of the corrugated box manufacturing. If the intensity of land filling is more than 60%, then it is the most responsible for environmental impacts. It is also responsible for the main source of global warming and acidification and for the development of sustainability assessment in an organization performance to waste-based sustainable manufacturing to be used.

From the case study, some changes can be improved the organization performance in corrugated industry.

If the recycling phase is used for whole product, then it is safe for environment.

Used interchangeable machinery for the production of corrugated box for the development of sustainability to improve the organization performance.

Include use phase and end of life treatment.

Improvement focus on the reduction of electricity use.

13.7 Future Scope

Further, the papers are identified with these three pillars of sustainability to be used for sustainability assessment: based on assessment tool and technique, outcome and waste elimination, mixed assessment. The scholar is improving the sustainability assessments by using tool and technique. Nowadays, the scholar-centered outcome is based on assessment. Similarly, the aim of sustainability assessment is to measure the NPD, human resource, financial, production process, suppliers and develop and improving the organization performance from these parameters. The future of automatic corrugation line is very bright. In upcoming 2020th, the corrugated product is very widely used. The current project was performed on Gate to Gate system boundary, for good performed considering the reusing as the alternative

and performing it by Cradle to Grave and the data can help to other scholars who want to do study on this field. This thesis can be used for improving the sustainability in improving the organization performance.

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