



Interpretive Structural Modelling (ISM) of Enablers Affecting Green Accounting in Indian Manufacturing Sector: A Conceptual Model

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ABSTRACT

Green accounting is vital for every economy in the world. Indian manufacturing sectors are regarded as one of the most significant contributors to environmental and socioeconomic problems, and as a result, the country lacks global sustainability and progress. This paper focuses on how these industries can contribute to the sustainability of the environment. The paper aims to analyze how these industries can promote ecopreneurial behavior. Also, the researchers and expert opinions lead to a theoretical framework and conceptual model using a well-defined and explained literature review and the derived model to understand, observe, and analyze various environment awareness concerns. To gather the expert opinions, various calls and surveys were scheduled with chartered accountants, academicians, environmental experts, commerce people, to understand how the identified variables are influenced by each other. Environmental management accounting and green accounting came out as the most significant and vital factors. All the identified variables were complementing. Three levels came out for the model. The authors created an ISM on factors affecting green accounting in the Indian manufacturing sector, emphasizing the context and concept related to the discovered variables that have been tested in the real world.

INTRODUCTION

The purpose of this research is to determine the significance of environmental accounting and sustainability in the Indian manufacturing industry. The core objective of this paper is to tell how important is, environmental accounting and taking initiatives for Environment Protection in this dynamic world. There has been a drastic change in the past two decades i.e., moving from a rather mysterious venture to one that has been tested in a number of nations and is well established in a few others (Hecht 1999). The term accounting is expected to give information to the users about the performances and financial position of an organization and in all the scenarios, environmental accounting is one of those tools which informs the managers about the different environmental costs and how they can quantify them (Todea & Stanciu 2010). According to Şenol & Özçelik (2012), environmental accounting has grown in importance and awareness as a result of the rise in environmental challenges related to economic, social, and technical development. Environmental accounting is essential for long-term growth. Globally, there is a rapid rise in public knowledge of sustainability, which is increasing (Lamberton 2005). There is a wide range of scientific research that has been applied to sustainable accounting.

The primary objective will be to determine the impact of environmental accounting as it relates to Indian financial

reporting systems and standards, as well as whether Indian manufacturing industries are taking these reporting requirements seriously to achieve long-term development (Brown et al.2010). Also, to understand how the Companies Act of 2013 and other similar legislation encourage and promote environmental consciousness, which will contribute to a rise in overall economic growth. This will close the gap on a variety of environmental challenges and move us closer to long-term growth.

As per Baumol et al. (1988), organizations with a higher and good history of performance along with environmental initiatives have less chance of bankruptcy. Even when they are in financial distress, they are more likely to overcome it. Finally, if we see on a larger picture, it is said that if the proper practice of environmental accounting is done, then it will ensure sustainable development and it must focus on environmental audit, environmental taxes, costs, and appreciation of the ecosystem services as all these things ensure sustainable development.

The purpose of this study paper is to learn more about how the environmentally conscious manufacturing business handles compliance and awareness. The research project's problem is to correlate latent variables to analyze industries that are accountable for environmental effect and environmental reporting, with a focus on Indian manufacturing industries.

PAST STUDIES

Environmental Reporting

Clarkson et al. (2011) stated that Indian manufacturing industries' environmental reporting has risen dramatically in recent years. The increase has occurred voluntarily, because of the compulsion of environmental disclosures. It was mentioned by Thakur (1997) that, the Constitutional 42nd Amendment Act came into force in 1976 and it contained Articles 48-a and 51-a, which made sure that every state and the citizens must protect and improve the environment and safeguard its wildlife sanctuary (Mickwitz 2003). This is how environmental policies were implemented, and as a result, the Government of India established a committee with a chairman who advocated various actions and steps to protect the environment. New policies to safeguard the environment are becoming more appealing, and there has been a rapid diffusion of informative voluntary and market-based tools on a global scale. Recent comparative studies state that there has been arising change in the development of environmental protection across the globe (Tews et al. 2003)

Green Accounting

In general, environmental/green accounting covers all the information and content adhering to the various stages of the domain and it is inclusive of linked expenditures, aids, and facts about its reportable operations (Irish Times 2000)

As per Yakhou & Dorweiler (2003), industries are contemplated to follow green accounting to give reassurance to the customers about the responsibilities being taken seriously, complying with financial reporting systems and the national guidelines, and disclose the company's environmental concerns and letting the stakeholders know about them.

According to Beredugo & Mefor (2012), there is a link between financial and environmental variables, which was established by quantifying all of an entity's work and activities in terms of its economic and environmental performance. As a result, by reducing environmental consequences and publicizing them, environmental managers boosted the value

Table 1: List of identified variables.

V1	Environmental Reporting (Legal environment framework, Environmental Disclosures)
V2	Green accounting (Global Environmental Accounting, Green Accounting Audit)
V3	Environmental Management accounting (Environmental Decision-making & Reporting)
V4	Environmental Financial accounting (Financial Reporting)
V5	Sustainability (Corporate Social Responsibility, Sustainability Accounting System)

of their industry. Environmental accounting, which connects environmental and financial performance, can be used to predict future environmental consequences on industry financial performance, allowing for more informed investment decisions.

In India, environmental accounting is still in its infancy, and what is recorded in the books relates to the observance of various Acts' norms and regulations. It is nearly difficult for India's financial industry and accounting to thrive unless the general public is made aware of environmental safety (Qureshi et al. 2012)

Environmental Management Accounting

According to Jasch (2003), the major goal of environmental management accounting (EMA) is to provide a comprehensive assessment of all environmental expenditures on treatment, disposal, and management, and because it is new, it poses a significant challenge for most manufacturing industries. In recent years, everyone has been focused on the growth of an expansive EMA framework, which primarily covered internal and external users of green accounting data (Burritt & Saka 2006).

EMA focuses on internal costs, and it includes the physical units for the overall consumption and disposal of energy and material, and the benefits costs and savings, which arise from environmental-related activities (Xiaomei 2004). Burritt et al. (2002) stated that EMA helps organizations to face various environmental responsibilities and leads to the identification and knowledge of combined environmental and economic benefits from different activities.

Environmental Financial Accounting (EFA)

The concept of environmental financial accounting is all about financial reporting where the industries report about their exposure management the impacts resulting from climate change (Grafl 2021). EFA points out the liabilities' costs of environment and other added costs, and it also gives the allied information about finance to the outside stakeholders (Xiaomei 2004). All the societal and global impacts that are material to the company are reflected by financial markets. EFA is partially governed by accounting standards issues by various bodies (Moisescu & Mihai 2006). Recent years'

Table 2: SSIM matrix.

i j	V5	V4	V3	V2	V1
V1	X	A	X	A	
V2	V	X	X		
V3	A	X			
V4	V				
V5					

studies state that a generous amount of attention was given to the impact of different forms of financial participation on the financial performance of industries (McNabb & Whitfield 1998). Adoption of IFRS (Indian Financial Reporting Systems) is necessary as it affects the financial performance and especially, gives an impact on the rate of return (Hameedi et al. 2021)

Sustainability

Empirical research into social and environmental management and reporting began in the early 1970s, and by the 1980s, the research had been mainstreamed around the societal performance of industries and on a theoretical platform of how to define and measure the various social and environmental performances, CSR or any kind of corporate citizenship, and other elements that are now referred to as sustainable management (Schaltegger & Wagner 2006)

CSR stands for “Corporate Social Responsibility,” and it refers to activities in which a company or organization is aware of how its operations and activities affect social, economic, environmental, and governance concerns, as well as all the steps it takes to disclose those concerns. “Sustainability” is one of the methods used by any company or organisation to publicly announce their CSR activities and various initiatives. In this fast-paced climate, businesses take such initiatives seriously and aren’t just concerned with short-term earnings (Hughen et al. 2014)

Biondi and Bracci (2018) stated that sustainability reporting is dominated by the private sector. Also, some of the observers consider it as one of the main forms of reporting in the business reporting system. Sekerez (2017) said that reporting

Table 3: Reachability matrix.

i j	V1	V2	V3	V4	V5
V1	1	0	1	0	1
V2	1	1	1	1	1
V3	1	1	1	1	0
V4	1	1	1	1	1
V5	1	0	1	0	1

Table 4: Level partitioning (Level 1).

i j	Reachability Set (RS)	Antecedent Set (AS)	RS ∩ AS	Level
V1	(1,2,3,5)	(1,2,3,4,5)	(1,2,3,5)	
V2	(1,2,3,4,5)	(2,3,4)	(2,3,4)	LEVEL 1
V3	(1,2,3,4)	(1,2,3,4,5)	(1,2,3,4)	LEVEL 1
V4	(1,2,3,4,5)	(2,3,4)	(2,3,4)	
V5	(1,3,5)	(1,2,4,5)	(1,5)	

on sustainability is one of the most effective means of accomplishing sustainable development goals, and it is also known to demonstrate better accountability to stakeholders and the implementation of a sustainable business model (Fijałkowska et al. 2018)

MATERIALS AND METHODS

Interpretive structural modeling (ISM) was used to derive this model on factors affecting green accounting for the Indian manufacturing sector. The steps followed to derive this model was classified into 3 stages -

1. The first stage is about the identification of variables through the literature review.
2. The second stage is about these identified variables validated through a survey from thirty experts (Chartered Accountants, Company Secretaries, commerce specialists, faculty members teaching subjects related to the environment were also contacted).
3. In the third stage, the steps for ISM were followed to perform the repetitive process for level partitioning and the derivation of the model.

RESULTS AND DISCUSSION

ISM-Research Method

Interpretive structural modeling provides the individuals or a batch of individuals to have connections between more than two variables at one point in time, without any compromise or deviation from the original characteristics of the variables. ISM is an interpretive tool as it is a list of judgments and interpretations of the individuals on whether and how variables are related. It was invented by John N. Warfield.

Table 5: Level partitioning matrix (Level 2 & 3).

i j	Reachability Set (RS)	Antecedent Set (AS)	RS ∩ AS	Level
V1	(1,5)	(1,5)	(1,5)	LEVEL 2
V4	(1,4,5)	(4)	(4)	LEVEL 3
V5	(1,5)	(1,4,5)	(1,5)	LEVEL 2

Table 6: Level matrix.

Level	Variable
1	Environmental Management Accounting
1	Green accounting
2	Sustainability
2	Environmental Reporting
3	Environmental Financial Accounting

ISM has the following dimensions-

1. To understand, it is structural, according to professional judgment, because of relationships and linkages. It also provides a graphical representation of iterations.
2. It is a learning process that is much interactive and consists of elements that are somehow related and thus, combined in a model.
3. It is a well-articulated methodology that identifies relationship amongst variables that leads to an issue or a problem.

In the next step, the development of a structural self-interaction matrix (SSIM) is done as per the sets of variables. The reachability matrix is then calculated, and the amount of transitivity is confirmed, before moving on to level partitioning. After data has been derived and drawn, an ISM model is created.

SSIM (Structural Self Interaction Matrix)

The SSIM is a basis of various interpretations of experts who have contributed a lot in this field. The experts for this study were Chartered Accountants, Company Secretaries, commerce specialists. Faculty members teaching subjects related to the environment were also contacted. The above experts were requested to compare each variable against the other. As per their comparisons, all these variables were assigned the values of V, A, X, and O. The connoting symbols of this table are ‘i’ and ‘j’ which establishes the relationship between variables.

Following are the rules from which the SSIM table was derived.

- 1) V is when i is related to j, but vice-versa is not the same.
- 2) A is given- j is related to i but vice-versa is not the same.
- 3) X is given- i & j complement each other.
- 4) O is given- no relation between i and j.

Reachability Matrix

The assigned values of SSIM will now be converted into binary numbers 0 and 1.

- [V- ‘i’ to ‘j’= 1 and ‘j’ to ‘i’= 0,
- A- ‘i’ to ‘j’= 0 and ‘j’ to ‘i’= 1,
- X- ‘i’ to ‘j’= 1 and ‘j’ to ‘i’= 1,
- O- ‘i’ to ‘j’= 0 and ‘j’ to ‘i’= 0]

Level Partitioning

Two sets come from the reachability matrix i.e., Reachability Set (RS) and Antecedent Set (AS). A series of repetitive steps were performed to identify various levels. Horizontal is reachability set and vertical is antecedent.

Level Matrix

The relationship between the five variables has been identified and categorized into 3 levels and their directions are represented by arrows.

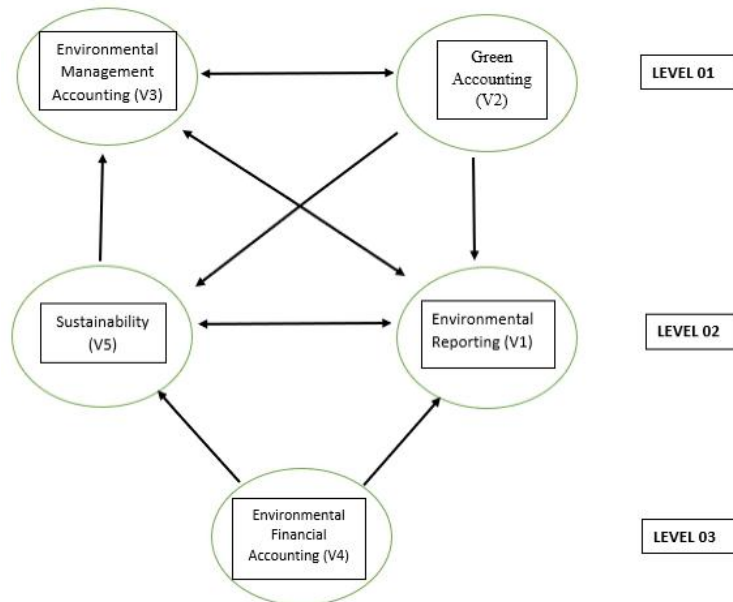


Fig. 1: ISM Model on factors affecting green accounting for Indian manufacturing industries (Authors’ contribution).

LIMITATIONS AND FURTHER RESEARCH DIRECTIONS

This study's findings are based on the opinions of numerous experts and not on a large sample of data. Therefore, the model can be further empirically validated and tested by using advanced statistical tools and techniques. Also, expert opinions can be supported with some technical data for future research.

CONCLUSION

There is a strong link between green accounting and environmental management accounting. Also, sustainability and environmental reporting are very important aspects for each other as they provide information related to natural resources and the well-being of the economy as well as the costs incurred because of environmental degradation. As these two (V1 and V5) complement each other, financial accounting plays an important role in fostering sustainability and environmental reporting. This research was centered on the identification and modeling of a conceptual framework in relation to green accounting issues affecting Indian manufacturing industries. All the identified variables turned out to be important and necessary. The model and conceptual framework described in this research can be used to construct numerous methods for sustainability and environmental protection that are both effective and practicable. One of the problems is that there are no established standards for evaluating environmental aspects.

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