

Exploring Eco-Costs and Externalities Absorption Policies and Procedures in the Context of Global Warming

Gina Raluca Gușe¹,
Cornelia Dascălu²,
Chirata Caraiani³,
Camelia Iuliana Lungu⁴,
Florian Colceag⁵

A set of recent international studies reveal the scarcity of coherent entity-level estimation systems able to lead to an adequate identification and valuation of social and environmental performance, despite the large number of entities claiming their concern for the environmental impact of their business activities. The status quo is mainly caused by the lack of domain-specific accounting regulation, along with a general "information gap" in the field of the potential benefits eco-costs and externalities absorption may generate.

Eco-costs and externalities absorption technologies for the costing model are still going through their experimental stages, aiming to reflect both the historical-political context and the philosophical motivations of an organization's management and stakeholders. We held as appropriate (and the paper at hand

¹ Academy of Economic Studies, Bucharest, Romania

² Academy of Economic Studies, Bucharest, Romania, cornelia.dascalu@cig.ase.ro.

³ Academy of Economic Studies, Bucharest, Romania, ccaraiani@cig.ase.ro

⁴ Academy of Economic Studies, Bucharest, Romania, camelia.lungu@cig.ase.ro

⁵ IRSCA Gifted Education, Bucharest, Romania, f_colceag@yahoo.com

will speak for) the intent to promote this class of technologies for the Romanian business environment, mainly by reviewing the relevant literature in the field and developing an eco-costing model able to provide cost levels consistent with the sustainable development goals.

Key words: Sustainable Cost Accounting, Eco-costs, Externalities, Sustainability, Eco-costs and Externalities Absorption

JEL classification: M41, Q51, Q56, F18

Introduction

The study is based on a complex research project, titled “Research, development and innovation in social and environmental accounting from the perspective of policies and procedures for global warming eco-costs disclosure in Romania”.

Promoting Full Cost Accounting (FCA) models in the professional and business environment in Romania has become a necessity, given the limited and insufficient information on the possibility of implementing such costing models. It is imperative that the results of experimental research in the field are centralized, with the participation of all involved, leading to a generally accepted approach. Subsequently, testing and perfecting such an accounting technology will allow stakeholders a better understanding of the absorption of eco-costs and externalities concept and its implications. Otherwise, we believe that any form of FCA will never be applied on a large scale or be subject to regulation.

The main objective of the present research is to design a costing model that absorbs/integrates eco-costs and externalities, adapted to the Romanian environment. As a first step, we explore general issues regarding eco-costs and externalities, as well as the relationship between financial and non-financial reporting and the accounting technologies for social and environmental reporting, in terms of

conceptual and practical compatibility. As a result, we provide a positioning of this study in light of the arguments expressed so far in the literature, both for and against incorporating qualitative aspects into social and environmental reporting. Next, we present an FCA costing model - *Sustainable Cost Accounting (SCA)*, as deemed to best meet specific needs of the Romanian economic environment. The model is formulated so as to solve conceptual problems reported in the first part of the study. Finally, we highlight the expectations on the possibility of implementing the model in the accounting of Romanian entities and the perceived limits of the research.

In the context of this study, the relationship between the academic environment and the business community plays a critical role in implementing the SCA model. In this respect, we find that a two-dimensional approach of the analysed issues is essential, highlighting:

- The actual and potential accounting contributions of accounting research to the design of the model, as well as
- The role of the professional and business environments in implementing and evaluating the model.

From a conceptual standpoint, we propose solutions based on previous research (Guse et al., 2009) and we develop an eco-efficient costing model, convergent with eco-balanced corporate management. The study identifies theoretical and practical difficulties involved in recognizing external effects of economic activities through social and environmental accounting, both internationally and nationally, representing a new approach of costing methods. We describe the possibilities of extending the conventional costing model to an eco-costing capable of generating costs compatible with sustainable development goals by designing, implementing and testing a four-stage model of Sustainable Cost Accounting - SCA. The recognition of eco-costs and externalities emphasizes the flexible side of accounting practices and transform accounting into an evolving science, able to record, monitor and provide decision support for the most sensitive

issues affecting the overall performance in the context of global warming.

In order to provide a valid accounting technology for the absorption of eco-costs and externalities in the form of the SCA model, the authors' proposals were preceded by extensive research through critical literature review of national, European and international studies in the field. Archival and empirical studies have been a source of specialized information relevant to the research of eco-costs and externalities in terms of social and environmental accounting and reporting.

1. Current state of knowledge in the field of policies and procedures for the recognition and measurement of eco-costs and externalities

The starting point of the research is represented by the results of several international studies which show that despite the large number of entities claiming their concerns for the social and environmental impact of their activities, very few have developed a coherent system to accurately identify and assess the social and environmental performance. In search of practical and theoretical justifications of this fact, the concept of externality is fundamental and representative.

The concept of external effect originates in neoclassical economic theory and it can be described as a phenomenon that occurs within or outside the market, but is detached from the source of the impact (for example, an organization engaged in pollution affects both the health of the community members and the environment). Healthcare costs required for reducing effects on individuals are *social externalities* identified on the market, but separated in time and space from the source of the social impact (pollution). Costs of global warming caused by pollution (damages caused by floods, natural fires, etc.) are *environmental externalities*, separated in time and space from the origin of the environmental impact. The costs of diminishing the environmental

impact of pollution to a sustainable level are *eco-costs* recognized in accounting as period costs, which are not absorbed in the production costs.

Conventional accounting does not recognize and assess these costs, often expressing the idea that traditional accounting techniques are incompatible with the concept of externality or, more generally, with sustainability accounting (Davies, 2009; Jones, 2010). For an organization to inform stakeholders on the social and environmental impact of its activities, voluntary reporting is an *apparent* solution, usually narrative, which may include recognition of externalities. From the user's perspective, such information is encumbered by all the drawbacks of a voluntary and unregulated approach, including selective disclosure and inconsistent information. In our opinion, the main limitation of voluntary reporting is the lack of legitimacy, caused by the fact that there is no requirement for inclusion in financial statements and, accordingly, no auditing requirement.

Analyzing the literature, we find two categories of studies which express views convergent with the objectives of sustainability, despite the contradictions of form.

On the one hand, we identify studies that express the authors' scepticism regarding the validity of social and environmental reporting. Thus, Gray and Milne (2002, p. 70) send the following message: "... *there is an awful lot of talk and very little action. Don't believe what you read, and social and environmental accountability will remain a "nice idea" until there is substantive legislation requiring it of all large organizations*". Also, authors such as Frame and Cavanaugh (2008, p. 2) consider "*the vast array of techniques and practices aimed at promoting sustainability can be reconceptualized through a post-normal science lens*". The authors believe that the issue of recognizing and assessing externalities through FCA models is central to "*post-normal sustainability techniques*", approaching adolescence: "... *keen to assert independence, yet still reliant on the security of its*

background disciplines and not quite mature enough to make its own judgments” (Frame and Cavanaugh, 2008, p. 1).

On the other hand, authors such as Bebbington and Gray (2001), Antheaume (2004), Herbohn (2005), Lamberton (2005), Bebbington, Brown and Frame (2006), Jones (2010) analyse existing models of sustainability accounting, propose and experiment with new models, and create the theoretical and conceptual framework of social and environmental reporting.

We believe that the situation described is a result of confrontation between two current phenomena, of which, so far none has emerged as dominant:

- *Accounting inertia* defined by Oldroyd (1999, quoted by Jones and Oldroyd, 2010, p. 7) as „*the reluctance to adopt new practices and ideas and the corresponding hesitancy to discard old ones*”; and
- *The scientific nature of accounting*, which requires flexibility when faced with changing paradigms, according with Kuhn's interpretation (1962).

Accounting reluctance to change does not preclude states of discontinuity. Therefore, accounting inertia can be overcome, if a sufficiently strong stimulus exists. When they occur, changes are gradual and resulting from processes of changing social attitudes. Accounting history proves the existence of a "flow" of reported information, despite the delay effect exerted by the phenomenon of inertia.

This state of fact is also an argument for conducting experimental research in the field of policies and procedures for the recognition and measurement of eco-costs and externalities. It is mainly due to the lack of specific accounting regulations and information concerning the potential benefits arising from their accounting recognition. Ball *et. al.* (2005) have demonstrated a directly proportional relationship between the size and evolution of negative externalities on the one hand, and

performance value, expressed through productivity, on the other hand. Thus, based on data from the agricultural sector in the U.S., they launched and mathematically proved the assumption that conventional measures of productivity (and hence performance) are overstated when negative externalities increase and understated when negative externalities are decreasing. A proper assessment of performance can be achieved only if performance indicators are adjusted to take into account the unconventional effects of an activity, more precisely the negative externalities and the positive externalities.

The aforementioned issues lead to the conclusion that the main problems of social and environmental reporting are: (1) the lack of specific regulations and (2) the immaturity of existing models. While maintaining voluntary reporting, the permanent compromise between the public (social) interest and the private (organizational) one is done in favour of the private interest. The role of normative accounting research in this field is even more important as it allows for testing of accounting models and techniques of eco-costs and externalities recognition and measurement, at a time when the market does not identify and measure such items. Thus, the two types of studies quoted cover one direction of action of normative research: they either argue the need to regulate or demonstrate the possibility of implementing innovative models of recognition and measurement of environmental and social impacts. The present study falls into the second category, proposing an accounting model for the absorption of eco-costs and externalities.

2. Developments of eco-costs and externalities measurement

Even among economists who have laid the theoretical background for the concept of externalities, their measurement has been a controversial issue. Pigou (1920) supports an interventionist approach, where the *measurement of externalities is done indirectly* by the state through regulations and specific taxes, having the role to compensate the inability of the market system to spontaneously reflect the prices of services provided by ecosystems. Coase (1960) supports the possibility of *direct measurement*, by confronting demand and supply on specific markets for trading environmental goods and services. The common element is the recognition of the need for a monetary expression of services provided by ecosystems and damages produced by economic activities on the natural environment. By solving the problems of measurement, the premises for sustainable costing of goods and services are created, and also integrated into the logic of internalising externalities.

During the last few decades, the measurement of externalities has been the subject of numerous investigations, with notable results both in terms of methodology and empirical evidence supporting the integration of externalities into decision models. The necessity to integrate information related externalities in decision models brings forward the issue of monetary quantification for heterogeneous elements, mainly qualitative in nature, external (in time and space) to the organization conducting the measurement. Therefore, the measurement of externalities can be regarded as a three-stage process (AAA, 1975): (1) identification and description of an externality-generating activity, (2) non-monetary measurements of activities' positive or negative effects (3) monetary transformation of costs and benefits identified in step (2). The final step is the most difficult as it involves allocating some costs to the organization, which are generated by external events and which are sometimes distant from the source, both in time and space.

Consequently, the main conceptual problem is the measurement of externalities in monetary terms, more precisely, the methods of processing information expressed in physical units so as to take a monetary form, which may influence the conclusions of a SCA experiment. We have identified the following approaches in the literature (Herbohn, 2005, Frame and Cavanagh, 2009) regarding the quantification of externalities in monetary terms:

- *Maintenance cost approach* which is based on the concept of maintaining natural capital and was used during the *Net Value Added* (held from 1990 to 1994), *Sustainable Rate* and *Interface Europe* experiments.

- *Asset valuation approach* aims to assess environmental assets and any changes in their value; it was used in the *Supplementary Economic Accounts* experiment (1995-1998) in the field of natural reservations.

- *Damage cost approach* refers to assessing the environmental externalities of an organization based on damage cost estimates and it was used in the experiments conducted at *Ontario Hydro* power plant in Canada.

Jones (2010, p. 132) offers a systematization of conceptual approaches used in assessing social and environmental impacts, identifying three measurement approaches for the full range of environmental corporate impacts, that we find are applicable in the case of externalities:

- A *damage cost* approach, considering the damages caused by the impacts;

- An *avoidance* approach, considering the costs of taking preventive action against environmental degradation;

- A *restorative* approach, considering the cost of restoring the environment to its pre-corporate impact state.

The last two approaches are adequate for eco-costs identified as potential costs of measures which should be taken to produce or dispose of an item in terms of sustainability. As today's society is far from being sustainable, eco-costs have a virtual nature and can be estimated through the *What-If technique*. The estimations are made in accordance with sustainable development requirements and take the form of changes accepted by stakeholders in factors involved in preventing environmental degradation.

The method used to measure externalities in monetary terms is closely correlated with the specific features of the industry where the experimental research is conducted. Cost-based approaches are appropriate for intensive natural resource industries such as the energy industry and allow comparisons between investment alternatives on the base of the cost of damages induced on the natural environment.

There are a lot of studies regarding the methods, advantages and disadvantages of measuring externalities. By providing a theoretical and methodological framework essential to exercise the option of measuring externalities, as well as by formulating selection criteria for selecting the appropriate method/methods, the accounting profession could contribute significantly to the accreditation of the idea that any measurement, even one with limited reliability, is preferable to the lack of any measurement (Costanza et. al., 1997; Yangang Xing et. al., 2007).

3. Experimental models of eco-costs and externalities recognition

Costs incurred by an organization to minimize the negative impact on natural and social environment are currently reported as a mix of financial information, such as expenses and contingent liabilities and non-financial information, such as descriptions of environmental policies, objectives and achievements in the field. Costs and benefits borne by society and the environment, but generated by the same

organization are most often described through non-financial information such as texts referring to the environmental impact, historical data about emissions or energy efficiency (Antheaume, 2004).

In contrast to this approach, *Full Cost Accounting* (FCA) aims to provide exclusive financial information for both conventional costs and eco-costs and externalities. According to the definition by Bebbington et al. (2001, p. 8), FCA is “*a system which allows current accounting and economic numbers to incorporate all potential/actual costs and benefits into the equation including environmental (and, perhaps, social) externalities to «get the prices right»*”. FCA is recognized as an accounting technology for approaching the concept of externality. The information generated by FCA may be used as background for economic decisions convergent with sustainability objectives or as a basis for setting environmental taxes.

The FCA model proposed by Bebbington and MacGregor (2005) involves providing information about externalities, currently missing from the market, by covering the four steps presented in *Table 1*. Note that the model is limited to the measurement of externalities, but it is not integrated with the traditional accounting costing model. As to the measurement of externalities, the avoidance of damages approach or environmental restoration approach are used when possible.

Table 1

Steps in FCA

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<ol style="list-style-type: none"> 1. Define the focus of the costing exercise (which may be, for example, a product, production process, waste disposal option, project, part of an economic entity an entire entity or an entire industry). This is the cost objective. 2. Specify the scope or limits of analysis (that is, what subset of all possible externalities is to be identified).

3. Identify and measure external impacts (which involve making the link between a cost objective and the externalities arising from the cost objective).
4. Cost external impact (monetisation of the externalities, or determination of the fuller cost associate with, which are not already captured, by the current accounting for the cost objective).

Source: Bebbington and MacGregor (2005)

In the absence of regulation, most FCA studies have reported the results of experimental research carried out in companies with significant environmental impacts. As a result, companies in energy and transport have most frequently requested the implementation of such a costing model to estimate the environmental impacts (mostly negative) and to formulate new strategies and policies to ensure sustainability (Bebbington et al., 2001, Ricci, 2003). Managerial initiatives in forestry or agriculture have lead to experimental studies aimed at estimating costs *and benefits* in the form of externalities, or at formulating policies and strategies for the preservation of the natural environment or at facilitating negotiations to obtain adequate financing in terms of frequency and amount. Davies (2009) has identified 16 studies that used experimental methods to evaluate externalities.

The disadvantage of experimental approaches is a lack of adequate systematization of the methods and techniques used. In this regard, Bebbington et al. (2001, quoted by Antheaume, 2004, p. 445) have summarized the results of experiments conducted so far in the field of FCA and focused on the following key issues:

- The adoption of FCA improves the knowledge of organisation's operations and helps to change the managerial axioms of a business;
- Some of the necessary measures for the sustainable development of a business are sometimes unavailable;

- The subtraction of externalities from the net income often has a significant impact on an entity's performance and may turn a profit into a loss;
- There is no basis for comparing externalities generated or incurred by two different entities due to differences in the methods used to identify and measure externalities.

Bebbington et al. (2001) anticipate further experimental research in the field of FCA, without involving the accounting profession.

Among subsequent studies that fall into this category, special attention may be given to works on *Sustainability Assessment Model* (SAM), a form of FCA, created in the UK and implemented in the oil industry, by companies such as British Petroleum, Oil and Genesis Gas Consultants (Baxter, Bebbington and Cutteridge, 2004), which was later applied in New Zealand infrastructure (Frame, Cavanagh, 2009) and adapted for the construction and urban development field (Xing et al., 2009). While in the the UK SAM was created by collaboration between academic researchers and consultants specialized in the studied field, the New Zealand version was developed as a government-funded research project. Regarding the methods of externalities measurement, the SAM experiments mentioned above have used the cost of damages method to measure of economic, resource, social and environmental flows.

In 2005, Herbohn has published the results of a (failed) experimental study regarding the use of *Full Cost Environmental Accounting* (FCEA) in an Australian government agency for managing forests on public domain.

4. Sustainable cost accounting. Accounting technologies for the absorption of eco-costs and externalities

Starting from the results of previous studies, we find that an exploratory FCA research in Romania is an adequate approach to contribute to the existing knowledge in the field. To this end, we propose a FCA-type model - *Sustainable Cost Accounting (SCA)* - as accounting technology for the absorption of eco-costs and externalities. SCA aims to (i) identify all external costs and benefits associated with an activity, (ii) recognize the costs of reducing the destructive impact on the environment and (iii) incorporate the resulted information in the decision-making process. The model is based on the assumption that, by incorporating eco-costs and externalities into full costs, society will be better informed in order to identify the optimal decisions and to achieve the objectives of sustainability.

According to the specific features of accounting experimental research, assessing the viability of the model is an extensive process, which implies the following steps: *design, implementation, and assessment* (Guse et al., 2009). Each phase addresses a specific aspect of the research issue, from the definition of the general costing model to the assessment of the managers' and other stakeholders' response to the new informational inputs.

4.1 Designing the SCA model

The purpose of the design stage consists of the formulation of a general costing model, indicating potential areas of implementation, identifying and, where possible, proactive solving of any implementation issues. At this stage, the approach is theoretical in nature, and it is based on previous research results in the field, such as successful but also failed experiments. The main challenge will be, at this stage, to define the specific parameters of experimental research in the Romanian environment, given the current state of regulations in

management accounting and corporate social responsibility, in conjunction with the legal provisions regarding environmental protection and information available in the field.

The SCA model follows the standard steps of FCA models as described by Bebbington et al. (2001), Bebbington, Brown and Frame (2006). It is therefore necessary, as a first step, *to define the type of entity* for which the costing model will be designed. Subsequently, *defining the limits of the costing model* shows what type of information will be measured and which will be included in the model based on relevance criteria. The relevant information will be *quantified in physical units*, such as the number of employees, working time, flow or volume of pollutant emissions, used natural resources, extraction areas that require rehabilitation, production structures to be equipped with emission control filters, volume of production, etc. The *quantification in monetary units* is achieved in certain cases through a simple conversion, but it also requires the use of specific methods for measuring externalities and eco-costs according with the objectives of sustainability.

The SCA model, adapted based on the 2005 Bebbington and MacGregor model and designed for the purposes of absorption of eco-costs and externalities into sustainable cost, is presented in *Table 2* (Dascalu et. al., 2009).

Table 2

Four-stage SCA Model

	STAGES	SPECIFIC ACTIVITIES
1.	Setting the costing object or the area of interest for determining costs	Identify a product, production process, a sub-entity, the entity as a whole, an entire industry, etc., as a general objective of determining the sustainable cost and attach the conventional costs
2.	Define the purpose	Identify all possible negative and/or positive effects

	and/or the limits of calculation	and choose only those relevant to the subject or area of interest set above; identify measures to avoid damage and/or environmental restoration, which generate eco-costs and are related to the costing object.
3.	Measurement of relevant external impacts and eco-costs	Quantify in monetary units the eco-costs and externalities relevant to the object or area of concern for sustainable costing
4.	Sustainable cost determination	Building sustainable cost, with the absorption of eco-costs and externalities as the support for market pricing, accurate disclosure to provide stakeholders with information and competitive advantage in the context of sustainability

Unlike other costing models mentioned above, SCA correlates conventional costs with eco-costs and externalities, presenting a sustainable cost of the cost object as the final stage of the model. Currently, the market does not recognize costs and benefits as externalities, or eco-costs, as part of the cost of a product or a service, which means that they remain on a notional level, not being part of real measurements. However, we believe the integration of eco-costs and externalities in conventional costing models is necessary if any FCA costing model is to be implemented or regulated.

The generalized and regulated implementation of the SCA model, so as externalities and eco-costs to be transferred on the market through the integrating accounting technology of costing, is a necessity supported by two features of the model:

- The assumption that market prices will be determined based on sustainable costs, including eco/costs, and
- The selection of eco-costs and externalities relevant to the cost object, which implies that both (i) the double recognition of some external effects (in the sustainable cost calculated by different

entities) and (ii) the non-recognition by all entities of others on the basis of the relevance criteria should be avoided, especially in the context of regional (area) sustainability.

4.2. Implementing the SCA model

The implementation stage firstly requires the decision regarding the field of the experiment and the subject entity. This also requires the largest amount of material, human and time resources. At this stage it is necessary to involve more actors, starting from the research team, the entity's management and representatives of the main stakeholder groups, as beneficiaries of the results. The research team will contribute to finalize the general costing model, by selecting an appropriate method for the measurement of externalities in accordance with the industry and the particular features of the organization's activity.

Based on previous research, we anticipate that during the implementation stage it will be necessary to solve practical problems, such as data availability, additivity of measurement units, limited knowledge of organizational impact on the natural environment and society, and the reliability of estimations (Herbohn, 2005).

During the implementation stage, special attention should be given to the collection of primary data, in a physical form, from sources that are internal and external to the organization, regarding its social and environmental impact. Studies show that the failure of an experiment may occur during the monetary conversion of information collected in physical units of measurement (for example, Chambers and Lewis, 2001). In other cases, to overcome this problem, some authors limit the scope of interest to social externalities (Baxter et al., 2004; Bent, 2005) or to information on environmental impacts (Howes, 2000; Herbohn, 2005). We believe that at this time a unilateral approach is not appropriate in Romania. Therefore, by "burning the stages", anticipating a number of difficulties which may arise during the

monetary quantification of heterogeneous information and correlating experiences from previous studies, we plan to incorporate social *and* environmental issues in the same model.

4.3. Assessing the SCA model

The stage of results assessment by managers and various stakeholder groups could be deployed as a questionnaire or interview-based research and it is crucial in assessing the perceived degree of success of the experiment. For this purpose it is necessary to identify which groups of stakeholders are politically active, interested and able to provide a feedback to the input of qualitative information regarding the organization's activity, in monetary terms. The managerial assessment should cover both its response to the new reporting framework, and its position to the results of the experiment, in terms of the cost-benefit ratio.

In our opinion, the formulation and implementation of the SCA model in Romania has the potential to contribute to two essential decision-making processes:

- Decision to purchase a product or a service, by comparing the environmental impact of products and services on the market;
- Decision to invest, by choosing the alternative with the lowest possible environmental impact.

5. Conclusions

Previous research on SCA has shown that corporate activities are not sustainable. A significant part of social and environmental costs are externalized, and SCA can be a useful tool due to its ability to indicate which externalities can be removed by redesigning manufacturing processes. The identification of current eco-costs and externalities

eligible for future absorption makes future measures to minimize exposure to costs possible. SCA has the potential to make a connection between externalities and organizations, rendering the hidden costs visible.

A number of important issues concerning externalities and eco-costs have not yet been examined in detail and can only be partially addressed through experimental research such as described in this paper.

Prior research in the field of externalities has focused on a limited (although very important) set of externalities, such as those associated with pollutant emissions, accidents or global warming. There are times when the current knowledge is insufficient, like in the case of externalities like noise pollution. Also, some externalities have not received adequate theoretical and empirical investigation. In addition, some industries, such as energy or transportation, mainly produce negative externalities. The problem of multifunctionality arises in industries such as agriculture, land and water reserves administration, because the implementation of certain policies can generate both external costs and benefits, requiring an integrated accounting approach.

Economic and in particular accounting research have fundamentally, constructively and experimentally approached externalities, creating a conceptual framework able to support the design of techniques and models for recognition, measurement and absorption. The issue of eco-costs has been addressed in the context of the need for sustainable development and it has represented a challenge for researchers in fundamental sciences: chemistry (Kawai and Tazawa, 2000) and physics (Vogtländer, 2010), applied in economics through further concerns of the authors regarding business strategies and a reconciliation between economy and ecology. The study of eco-costs represents border-research, characterized by its interdisciplinary and holistic nature. The statement is supported by documented but

incomplete (Kawai and Tawaza, 2000) or failed (Herbohn, 2005) experimental research.

In the professional and business environment, information about the possibility of implementing some form of FCA is insufficient, which raises the question of promoting and disseminating such an approach. The demarche can only materialize with the support of five stakeholder groups, defined both nationally and internationally: the state, the accounting profession, the academic environment, the business environment and non/governmental organizations.

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