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EFFECTIVENESS OF SUSTAINABILITY INDICATORS

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Abstract. Sustainability is probably one of the most challenging tasks of today's economic world. Not for nothing more and more companies decide on using indicators to measure their sustainability performance. Although, numerous indicators have been developed and used to measure sustainability performance, very little research has been done on their actual effectiveness. Since sustainability can be increasingly seen as a competitive advantage, it is fundamental to use appropriate indicators to measure sustainability for achieving optimal target tracking. Therefore, this paper introduces a new concept to approach the effectiveness of sustainability indicators towards company goals. The most effective indicators are the ones to focus on and to improve in order to ensure a maximum degree of target achievement in terms of sustainability which can lead to competitive advantage in a highly competitive economy.

Keywords: sustainability, indicators, effectiveness, target achievement, measuring.

Jel classification: D20.

1. Introduction

Sustainable development is a development that "meets the needs of the present without compromising the ability of future generation to meet their own needs" (WCED 1987). This is probably the most commonly known definition of sustainable development. Being sustainable, is one of the most important and difficult challenges of today's economic world. Therefore, researchers and industry are being challenged to find ways to constantly implement sustainable approaches, especially in industry. Although, the idea of sustainability itself is not new, there is much more potential available in order to maximize gains and profits in a sustainable way.

Nevertheless, companies have realised the importance of sustainability, their role within the issue and the opportunities involved. During the last years some companies have integrated sustainable factors in their operations and they are ready to work on the establishment of a sustainable corporate culture. Publishing sustainability reports is one step towards this direction. Within these reports not only financial performance is of importance but also environmental and social perfor-

mance. Therefore, besides financial indicators, environmental and social indicators have to be identified, recorded and evaluated.

Since many indicator frameworks in literature do not provide a set of indicators but offer a menu of indicators (Morford 2007) from which to select for the individual case, decision makers are being challenged to choose the right indicators that are most effective. However, the question is: how can be decided whether or not indicators are effective?

The aim of this paper is to provide an approach to answer this question. To a certain extent the proposed method can give direction to the effectiveness of sustainability indicators which can help management to make decisions that improve company performance and gather competitive advantage in a highly competitive economy. The objective is to provide a checklist that considers the selection of indicators, their relevance to company goals and the interdependencies of indicators, since these are important aspects when being concerned with indicator effectiveness.

At first, the paper describes the role of indicators, the different selection approaches and current indicator frameworks. Then the terms effectiveness and company goals are being discussed in order to lead over to the development of a method to approach the effectiveness of indicators. The paper concludes with a discussion of the proposed method by summarising the strengths and weaknesses as well as strengthening the necessity of sustainability.

2. Sustainability indicators

When being concerned with sustainability, indicators need to be selected that target the issue. The basic idea of sustainable development is to link together the following three aspects: economy, environment and society. These are often called the three pillars of sustainability (Azapagic and Perdan 2000). Therefore, sustainability indicators need to address not only economic issues but also environmental and social issues (Veleva *et al.* 2001).

All three dimensions are related to each other and affect one another. These interactions can only be ignored for a limited period of time. Nevertheless, in the long run the three pillars of sustainability, also known as the “triple bottom line” need to be considered and respected equally (Krajnc, Glavič 2005). Otherwise, environmental consequences remind us to consider these dependencies and act accordingly; otherwise we takte the risk that the cost of ignoring sustainable aspects will exceed the financial gains(Strange and Bayley 2008).

In addition it can be argued that the consideration of sustainable factors could increase a company´s performance remarkable (Eccles *et al.* 2012).

2.1 The need for indicators

Since "you cannot manage what you cannot measure it is important to measure" sustainable performance in order to manage it. Although the idea of sustainability is fairly simple, it is not easy to measure. However, one approach towards measuring sustainable performance is the use of sustainability indicators.

Indicators can be seen as management tools that help to achieve business goals. They deliver valuable information for internal decision-making, target setting, monitoring and steering performance, benchmarking and reporting. In addition, they are valuable for external purposes and for external reporting (Kuhndt 2002). According to Ranganathan (1998) there are several reasons for companies to report on their financial as well as environmental and social performance.

These are:

1. Competitive advantage
2. Environmental Management Systems
3. Supply Chain Pressures
4. Credit and Investment Conditionality
5. Stakeholder Concerns
6. International Standards
7. Peer Pressure and
8. Voluntary Reporting

Gathering indicators, however, is associated with considerable effort. But once implemented, they can provide a company with many advantages as mentioned above. Additionally, indicators can provide an overview of relevant progress and highlight problem areas (Jasch 2000). Most importantly sustainability indicators can be used to translate the concept of sustainability into numerical terms (WBCSD 1999). This way sustainability is translated into measurable components, which is fundamental for the success of sustainable acting.

2.2 Selection of indicators

In literature there are mainly two approaches discussed for selecting indicators. There is the top-down and the bottom-up approach. Within the top-down approach experts and researchers define the set of indicators and the according framework. When applying the bottom-up approach different stakeholders are integrated into the selection process and the framework design (Lundin 2003). Although, these approaches are controversy, numerous methods have been introduced combing both approaches and benefiting from the respective advantages (Faucheaux *et al.* 2003; Chamaret *et al.* 2007).

Besides the decision-level of selecting indicators, the nature of indicators is also important. An international meeting was held in Italy at the Rockerfeller Foundation's Study and Conference Center in 1996. The group elaborated the 'Bellagio

Principles' that are supposed to serve as guidelines among others for the choice and design of indicators (Hardi, Zdan 1997).

In general, the main requirement is that indicators are simple and directionally safe. In order to be simple the number of indicators needs to be limited and the methodology of calculating them transparent. Directionally safe, on the other hand, means that the indicators need to be relevant and significant in terms of importance for sustainability (Spangenberg 1998).

2.3 Indicator frameworks

Over time countless indicator frameworks have been introduced in literature. The Organisation for Economic Co-operation and Development (OECD) has developed the Pressure–State–Response framework which is based on the concept of causality (OECD 1998). This framework has been extended by the OECD to the Driving Force–Pressure–State–Impact–Response framework and has been adopted by the European Environmental Agency (EAA) and the European Statistical Office. The additional components are driving forces and impact. The driving forces describe public and economic actions and processes that apply pressure to the environment. The impact, however, is concerned with the specific influence of pressures on the environment. These include e.g. greenhouse effects. (EPA n.d.).

The Lowell Center for Sustainable Production has developed a five-level framework that focuses on sustainable production and considers mainly the environmental, health and safety aspects of sustainable production (Veleva, Ellenbecker 2001).

Besides the three dimensions of sustainability, society, environment and economy, the United Nations Commission for Sustainable Development (UNCSD) has added the institutional aspect. In 1996 the commission has introduced 134 indicators covering these four aspects. However, after a worldwide testing phase the number of indicators could be reduced to 58 core indicators. These are the main basis of the constructed theme indicator framework. However, the framework focuses on the evaluation of progress towards sustainable development at a governmental level (UNCSD n.d.).

Another framework focusing mainly on reporting is the Global Reporting Initiative which has been developed by the United Nations Environment Programme and the Coalition for Environmentally Responsible Economics. The framework is hierarchically organised and considers the three dimensions of sustainability. The main goal is to enhance "the quality, rigour and utility of sustainability reporting" (Robertson 2009).

The Institute of Chemical Engineers has developed a set of indicators for the process industry in 2002. The aim is to measure the sustainability of operations within the process industry. The indicators include the social, environmental and economic aspects of sustainability (IChemE n.d.).

In general, most indicators frameworks are aware of the importance of sustainability indicators and propose methods to select and implement them. However, only little research has been done on the actual effectiveness of indicators toward company goals which is fundamental for improving sustainable performance.

3. Effectiveness and indicators

Basically in every successful company indicators are being used in some sort to manage company activities and to achieve company goals. The more effective the indicators are in terms of company goals the more successful a company can be. According to Veleva and Ellenbecker (2001) the effectiveness of indicators is influenced among others by top management commitment and involvement of key stakeholders. However, in order to determine the effectiveness, we need to understand the meaning of the term effectiveness first.

3.1. Efficiency vs. effectiveness

In connection with sustainability the term (resource)-efficiency often appears. When being efficient, this is one step towards sustainability. However, the term effectiveness has gained popularity as well. Oftentimes the difference between the two terms is unclear and sometimes they are being used interchangeably. Most authors in Anglo-American literature, however, make a clear distinction between efficiency and effectiveness (Steers 1975; Katz, Hahn 1978; Cameron, Whetten 1983). Efficiency can be defined as a measure for profitability in terms of an input-output ratio and effectiveness can be defined as a measure for the achievement of goals (Scholz 1992; Näf 1998). Kanter and Brinkerhoff (1981) describe efficiency as doing the things right and effectiveness as doing the right things (Table 1).

Table 1. Efficiency and Effectiveness (Source: compiled by author)

EFFICIENCY	EFFECTIVENESS
Do the things right	Do the right things
Measure for profitability	Measure for achieving goals
Input-Output Ratio	Efficacy

The main concern with efficiency is that it only slows down the process of destroying the environment and the depletion of resources by producing more with less (McDonough, Braugart 1998; Braungart *et al.* 2007). However, it is important to do the right things before doing the things right. Therefore, economy needs to

become effective first and then become efficient in order to be sustainable (McDonough, Braungart 1998).

3.2. The role of company goals

It is part of business strategy to know the current position as well as the profile of the company and to know where the company wants to get in the future. Therefore, company goals need to be set in a way that they are to be achieved throughout a defined period of time. However, it is not enough to define company goals to think about the way companies want to choose. The progress toward or even away from these goals need to be monitored carefully. This can be done by indicators (Parris, Kates 2003). When being concerned with sustainability, the company goals need to be in line with the idea of sustainability in order to become sustainable. In addition, the indicators monitoring the progress of acting sustainable need to be effective.

3.3. Determining effectiveness of sustainability indicators – an approach

One can say that sustainability indicators are effective, when they, on the one hand, measure progress of what they are supposed to measure, meaning that indicators need to comply with the company goals. These company goals have to be selected in accordance with the idea of sustainability and they need to be supported by management in line with stakeholder requests. The same applies to the indicators. Since the effectiveness of indicators depends significantly on management commitment and stakeholder involvement, it is highly recommended to select sustainability indicators by a bottom-up/top-down approach (see 2.2 Selection of Indicators).

On the other hand, indicators are effective, if the improvement of the indicator value leads to improved progress towards company goals. Because only improved progress towards company goals, leads to achieving them which again is effective.

Therefore, effectiveness of indicators considerably depends on:

1. Choosing the right indicators
2. Commitment of management
3. Involvement of stakeholders and
4. Abilities of indicators to improve progress by providing the right information that leads to necessary decisions that result in increased progress.

To assess the effectiveness of indicators, the selected indicators need to be allocated to the company goals at first. This is very important and helps to review once again whether or not the selected indicators cover all the company goals.

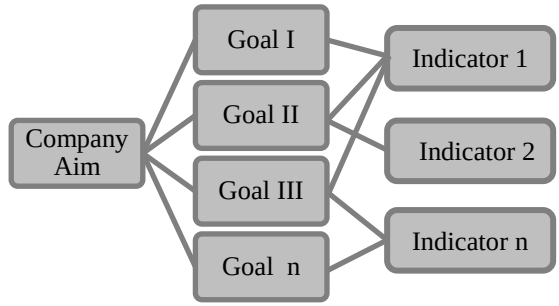

Fig. 1. Company Goals and Indicators (Source: compiled by author)

As indicated in Figure 1, goals can be influenced by several indicators. In this example, Goal II is being influenced by Indicator 1 and Indicator 2. As it is possible that goals are being impacted by several indicators, these need to be weighted according to their level of influence toward the goal. For example, it could be the case, that Goal II, is being influenced by Indicator 1 by 20% and by Indicator 2 by 80%. Assuming that all goals are being fully covered by indicators, every goal is being weighted with 100%. The indicators, however, do not have to be weighted with 100% but can differ, which reveals their overall importance towards the goals (Table 2).

Table 2. Weighting of indicators regarding their influence on goals (Source: compiled by author)

	Indicator 1	**Indicator 2**	**Indicator n**	**Sum**
Goal I	100%			100%
Goal II	20%	80%		100%
Goal III	50%		50%	100%
Goal n			10%	100%
Sum	170%	80%	60%	

In this particular example, Indicator 1 is very significant with a weighting of 170%. Indicator 2 is also quite important, however, Indicator n, is of minor but not little importance with a weighting of 60%. This overall weighting, though, gives only a general idea of the importance of indicators. Indicator 1 may be highly relevant in general, but regarding Goal II, Indicator 1 is of little importance. Therefore, not only overall weighting should be considered but also the individual goal-weighting.

Since it is very difficult to determine the weighting based on specific criteria, the weighting needs to be based on experience. In many cases, it is advisable to do this in a team to combine different experiences and to make the decision on the basis of discussion.

In addition to the weighting, the direct interdependencies of the indicators need to be considered as well. In general, there are three possible dependencies between indicators as shown in Table 3.

Table 3. Dependencies of Indicators (Source: compiled by author)

DEPENDENCY	CONSEQUENCE	DEGREE OF EFFECTIVENESS
No Dependency	No Consequences	Neutral
Positive Reinforcing Dependency	Positive Consequences	High
Negative Reinforcing Dependency	Negative Consequences	Low

If there is no dependency between indicators, a change in value of one indicator does not affect the value of the other indicator. The status can be seen as neutral. In case of a positive reinforcing dependency, the improvement in value of one indicator results in improvement in value of the other indicator. Negative reinforcement dependency, however, is when the improvement of one indicator results in deterioration of another indicator.

In terms of effectiveness positive reinforcing dependencies are highly desirable. When focusing on improving one indicator, the other indicator improves as well, which results in making progress towards two or even more company goals. Negative Reinforcing Dependencies, on the other hand, have a negative influence on the effectiveness of an indicator. In this case it mainly depends on the extent. If the overall improvement is higher than the deterioration, the dependency at least does not lower the overall influence on achieving goals. However, it the extent of influence is not optimal either. If the overall improvement is lower than the deterioration, the dependency negatively influences the overall aim of achieving goals.

Consequently, the more indicators have positive reinforcing dependencies, the better it is. It is worthwhile to have a maximum number of these indicators and preferably few to none indicators having negative reinforcing dependencies.

Since interdependencies are generally of complex nature, it is not simple to determine them. However, it is necessary to be aware of these interdependencies because they have an effect on the ability of indicators to improve progress. Every indicator needs to be analysed regarding its relation to the other indicators.

Once all the information mentioned above is being gathered, the questions of the following checklist can be answered. These can help to identify whether or not an indicator is effective.

These are the questions of the checklist:

1. Was the indicator selected with the bottom-up/top-down approach?
2. Is the indicator simple and directionally safe?
3. Does the indicator influence/measure at least one goal?
4. Does the indicator have a significant overall influence?
5. Does the indicator have at least one significant individual impact?
6. Does the indicator have positive reinforcing dependencies or at least more than negative reinforcing dependencies, resulting in a positive overall effect?

The more questions can be answered with "yes", the more likely it is that the indicator is effective. This checklist can be used for any sustainability indicator within the company. However, one needs to be aware, that the degrees of effectiveness are not absolute but in relation to all the other indicators. This means that it can only be stated that one indicator is x-times more or less effective than the other indicator. Nevertheless, this gives an idea on which indicators to focus on in particular in terms of improving them.

3.4. Discussion

The suggested approach to determine the effectiveness of indicators toward company goals can be used by decision-makers within any company. The method can be applied universally and is not designed for a special type of industry. In addition, both management and stakeholder opinion are being considered as well as the dependencies of indicators, which are fundamental aspects of effectiveness. Furthermore, the indicators are not being treated individually but as a whole. Although, it might be difficult to identify these interdependencies, it is necessary for detecting important influences. These influences again have a significant effect on effectiveness. In order to sum up the information, the method also provides specific questions that need to be answered which serve as a guideline for approaching effectiveness towards company goals. Therefore, the approach is generally easy to understand. Even if, the information needed is not always easy to gather, it is one starting point towards a more sustainable economy. It is better to make an approach toward determining the effectiveness of indicators than to ignore their effectiveness because of difficulties in gathering information.

However, besides the strengths, the method also has some weaknesses that need to be mentioned. At first the approach is very subjective because the degree of influence of indicators toward company goals is determined by experience and opinion. Another drawback is to ensure that the selected indicators cover the company goals sufficiently. This is especially important, since the indicators can only be effective if they represent the company goals completely. Furthermore, the sim-

plicity of the method does not reflect the complexity of sustainability, indicators and effectiveness. The author is aware of the fact that the answers of a simple checklist cannot be used to determine the effectiveness of indicators as a whole but can only give direction to the degree of effectiveness. However, when trying to improve effectiveness, this would be a starting point. Furthermore, the proposed method may be easy to understand but it is not as easy to apply, especially, since no detailed guidance is provided on how to weight indicator influence and how to identify dependencies of indicators.

4. Conclusions

This paper focused on the effectiveness of sustainability indicators toward company goals. The proposed method is an approach to determine the effectiveness of sustainability indicators to some extent. Within this method not only management and stakeholder involvement is being considered but also the dependencies of indicators. Both, the individual company goals, selected by management in line with stakeholder requests, and the corresponding selection of indicators, are critical factors for determining effectiveness. In order to support the evaluation of indicator effectiveness, the author proposes a checklist for orientation.

Since acting sustainable becomes significantly important in today's economy, it is crucial to address the issue of indicator effectiveness. Only effective monitoring of progress toward company goals can help to improve overall sustainable performance and therefore may lead to competitive advantage which is essential for company survival in a global market that is as highly competitive as it has never been before.

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