Sustainable Process Management - Status Quo and Perspectives

Dennis Kundisch, Philipp Herrmann, and Christian Meier

University of Paderborn,
Chair of Business Information Systems - Information Management & E-Finance
{Dennis.Kundisch,Philipp.Herrmann,Christian.Meier}@wiwi.upb.de
http://www.upb.de/winfo2

Abstract. Sustainability in the context of information and communication systems is often discussed using the technical term "Green IT". However, Green IT-concepts often just address the infrastructure level of an information and communication system architecture. Acknowledging the potentially huge contribution to sustainability improvements that lies in the adequate design of processes, we discuss concepts to evaluate and compare different process designs with respect to sustainability considerations.

Keywords: Process management, process design, sustainability, economic dimension, ecological dimension, social dimension, Green IT.

1 Sustainable Processes?

Sustainability has become "en vogue" both in research as well as in business and is used inflationary – sometimes in a correct way, most of the times not. Hardly any new product can be found that is not marketed with the adjective "sustainable" and there is hardly any company that does not praise itself as being sustainable and producing sustainably.

Sustainability is often associated with the level of consumption of natural resources causing emissions of so-called "greenhouse gases" like carbon dioxide and equivalent gases (in the following: CO_2e gases). CO_2e gases are believed to cause global warming, which in turn – if too high – may have devastating consequences on the biospheres of human beings, animals and plants [1]. Although the UN Climate Conference in Copenhagen in December 2009 was not concluded with a globally binding treaty concerning the reduction of emissions, sustainability will still remain on the political agenda for the coming years.

In this context Information Technology (IT) is discussed from two perspectives: On the one hand, the usage of IT currently generates almost 2% of the total emissions of CO_2e gases – and this usage is believed to grow further in the coming years [2]. Thus, IT-induced emissions of CO_2e gases have become a relevant factor in the overall emissions production and sustainability considerations have to be applied to the employment and usage of IT. On the other hand, IT is often cited as one of the most promising factors contributing to savings

W. Dangelmaier et al. (Eds.): IHNS 2010, LNBIP 46, pp. 94–106, 2010.

in emissions of CO_2e gases. Still, research with respect to IT and sustainability is often just concerned with efficiency considerations on an infrastructure level so far. These activities are subsumed under the key word "Green IT". The potential for savings in emissions of CO_2e gases, however, seems much more promising on higher levels of an information and communication system architecture. Especially business processes as the glue between the business model of a company and its implementation using IT- and also non-IT resources appear as an attractive starting point for such considerations.

Research has done comparably little so far to define characteristics of a sustainable process. Based on a literature review and conceptual considerations, we discuss and analyze opportunities for a process design that improves sustainability. We find the following: (1) There are already some valuable instruments available that may help a company to improve its processes in terms of sustainability, however, the business case for the employment of these instruments is all but clear. (2) The usage of such instruments would be dispensable if prices reflected all costs associated with the usage of a specific resource. (3) Strong governments and global agreements seem to be the dominant, yet tough to implement strategy to internalize currently external costs and, thus, to provide economic incentives for companies to produce and act in a more sustainable way.

The remainder of this paper is organized as follows. In the next section sustainability is briefly defined. Afterwards, an introduction to "Green IT" as the umbrella term for sustainable activities in the area of IT is provided as a starting point for the discussion. Subsequently, sustainability is discussed on the process level, which is the main focus of this paper. We propose an idealized model to support the decision on alternative process designs and present selected instruments to facilitate this task. We conclude with a discussion and summary of our findings.

2 Sustainability - Definition and Description

Originally, sustainability relates to forestry. In a very broad und fuzzy definition, forestry is called sustainable, if just as much timber is cut down as can replenish to maintain the basis of life for future generations [3]. A definition that is not just related to forestry can be taken from the Brundtland report authored by the World Commission on Environment and Development published in 1987 [4]:

> *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

Based on this view, the adopted "Agenda 21" at the Rio Summit in 1992 broadly distinguishes three dimensions of sustainability and types of capital that shall be preserved [5],[3]:

- Ecological sustainability - natural capital
- Economic sustainability - economic capital
- Sociopolitical sustainability - social capital

These types of capital often exhibit characteristics of complements rather than substitutes. Even if substitution appears to be possible for a specific function, due to the multi-functionality of each type of capital, substitutability is often limited. Therefore, the central idea of sustainability evolves from the integrated view on these dimensions.

Corporate sustainability – doing business in a sustainable way – is concerned with balancing these dimensions in managerial decision making. Hence, it is called the *three-pillar-model* or the *triple-bottom-line-theory* in literature [5]. The requirement to have an integrated view on the three dimensions necessitates the availability of instruments and key figures to evaluate and, ideally, compare the performance within and between these dimensions. While the literature with respect to economic capital is rich and comprehensive, natural and social capital have been neglected so far.

The economic dimension is primarily concerned with economic efficiency, i.e. the ratio of monetarily evaluated inputs and outputs and the creation of shareholder value [6]. Due to this normalization on monetary terms, the comparison between alternatives is relatively easy. This is not true for the ecological and social dimensions. E.g. the social dimension is concerned – among others – with equal rights and opportunities, prohibition of child labor, job security, "good" management principles, salary structure and employee benefits, reduction of health and safety risks at the workplace, continuing education, fighting corruption, and cultural engagement [5].

Obviously, to achieve "social efficiency" – or at least an improvement in "social efficiency" – is much more fuzzy and complicated compared to the economic dimension, given all the different aspects listed above and taking into account the partially conflicting goals of different stakeholders. The same holds for the ecological dimension.

For our further argumentation it is important to be precise about the semantics, when we use the terms *economic*, *ecological*, and *social*. For each resource somehow consumed in the production process (input) and each output – which may be products, services or waste – we theoretically distinguish between an economic, ecological, and social part. The economic part comprises all effects that are mediated by market or market-like prices, whereas all effects that are not mediated by market prices are either ecological or social. Here, the distinction is made based on whether the input or output directly (social) or indirectly (ecological) affects a human being.

Two examples shall illustrate this special view: (1) Take the example of labor as input factor. If we talk about the economic dimension of this factor, we refer to all aspects of this input factor that are reflected by its market price. This includes the manpower, the social benefits that may be legally prescribed or provided in order to motivate the employee and measures that are taken to increase employee satisfaction in order to increase labor productivity. However, all measures that aim at employee satisfaction as an end in itself constitute the social part of labor. (2) The consumption of electricity as an input factor is another example. All effects of the pollution and potential consumption of natural

resources while producing electricity that are reflected in the market price – e.g. due to emissions trading – are denoted economic, whereas any remaining pollution in this production process is denoted ecological. Obviously, over time, social and ecological parts of an input or output may become economic and vice versa – dependent e.g. on legislation, consumer buying behavior, strategy, and other influence factors.

Based on the definitions above we turn now to the concept of "Green IT" as the starting point for our considerations and discussion.

3 Green IT

In 2007, the European Union (EU) announced their plan to reduce the emissions of greenhouse gases by 2020 to approximately 70-80% of the emission level in 1990. Almost 2% of the total emissions of 45 billion tons of CO_2e gases are generated by IT. The use of IT has increased drastically over the last years and it will continue to grow in the future. In 2020, the world-wide use of IT is expected to be three times higher than today and the share of IT in the total CO_2e emissions will rise to approximately 3%, which equals the amount of CO_2e emissions of today's world-wide air traffic. Not even the expected improvements in energy efficiency of IT are able to compensate for this effect. Approximately 40,000 terawatt-hours are required to operate today's IT-infrastructure in the EU, which produces energy costs of about €6 billion. In addition to increasing energy costs, companies have to expect penalty payments raised by the EU, if the reduction of CO_2e emissions cannot be met.[2]

Because of these reasons, the demand for a more energy-efficient IT has arisen under the key word "Green IT" and attracts more and more practitioners and researchers. A survey [7] showed that the definition of "Green IT" in most companies is blurry, but it seems that an agreement can be achieved by understanding "Green IT" as a collective term for IT-products and -services which reduce energy consumption. In addition, "Green IT" contains all activities and solutions that support a more environmentally friendly production of IT-hardware and reduce the energy consumption of the IT-infrastructure employed, as for example, the use of more energy-efficient Thin-Clients. "Green IT" of today is focused on office environments and electronic data processing centers (EDPC). Server- and memory virtualization as well as the optimization of network structures are typical "Green IT"-activities in the field of EDPCs. The company IBM, for example, reorganized an EDPC radically and thereby reduced the number of servers required from 3,900 to 33. This decreased the energy consumption of this EDPC by 85% [2].

In office environments, "Green IT" focuses, for instance, on shared-desk concepts and the use of more energy-efficient laptops rather than on conventional desktop computers. Most of today's "Green IT"-activities and -solutions are related to just the infrastructure level of IT. A survey of McKinsey [8] indicates, that infrastructure-related "Green IT"-activities mentioned above can significantly reduce the resource consumption of an individual, but that the global CO_2e emissions can just be reduced by 0.5 billion tons maximum. According to

McKinsey, the highest potential for reducing CO_2e gases lies in the comprehensive use of IT in order to enhance the efficiency of business processes. McKinsey estimates that the use of IT to support sustainable process management can reduce the CO_2e gas emissions by 7.3 billion tons (in just four selected industries) which equals 15% of the expected emissions in 2020 [2].

A few activities – by some authors still subsumed under "Green-IT"– already try to bridge the gap between the infrastructure level and the level of business processes by e.g. substitution of business trips with videoconferencing or the use of electronic mail instead of paper-based mail to reduce the consumption of raw materials. By reducing the energy costs (economic capital) and thereby the amount of resources consumed, these activities implicitly make a contribution to the ecological aspect of sustainability. Usually the possible social impacts – positive or negative – are not considered at all.

In the following, we will discuss concepts to evaluate and compare different process designs with respect to sustainability considerations.

4 Sustainability on the Process Level

As pointed out in the last section, IT has a great potential to enhance the efficiency of business processes. We describe an idealized model of how the three dimensions of sustainability can be integrated into management decisions on this level. Due to restrictions which hinder the real-world application of our model on a global level, we present different instruments to – at least partly – measure and integrate these dimensions on the company level.

4.1 Idealized Model

Based on our definition of sustainability we present an idealized model of how sustainability can be implemented on a process level. Following [9] and [10] we define a process as the self containing sequence of temporal and factual connected activities that are necessary to handle an economically relevant object. A process can be seen as the transformation of predefined inputs through a production function into predefined outputs. In contrast to the position of the classical production theory and in analogy to our definition of sustainability we do not only consider the economic, but also social and ecological parts of process in- and outputs for our model (see figure 1 left hand side). Therefore, we have an economic, ecological, and social in- and output dimension for every process, where the measuring units of the ecological and social dimension do not have to be the same as the measuring unit of the economic dimension. For that reason, the improvement of a process in at least one dimension of sustainability could lead to two different situations:

1. It is possible to improve a process in at least one dimension without worsening one of the other dimensions (Pareto improvement).
2. It is possible to improve a process in at least one dimension while at least one other dimension deteriorates.

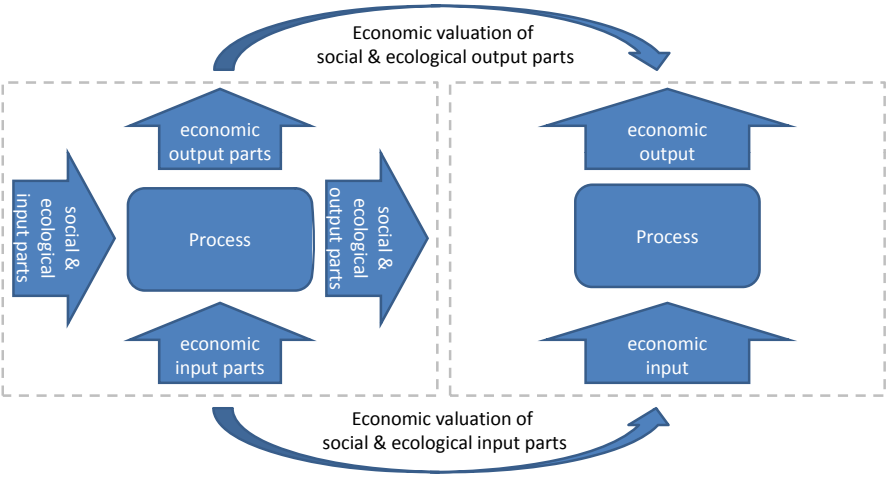

Fig. 1. Idealized sustainable process management model

If the possibility of a Pareto improvement exists, this improvement leads to an increased sustainability of the process and should always be implemented. The second situation leads to a multidimensional decision problem with a tradeoff between at least two of our sustainability dimensions. In this case, a decision maker has to decide in which proportion a gain in one dimension could compensate for a loss in at least one other dimension; let alone the question of compensation within one dimension itself. If the accumulated gains compensate for the accumulated losses, this modification improves the process in terms of sustainability and should be implemented. For accumulated gains that do not compensate for accumulated losses a modification would impair the process in terms of sustainability and should not be implemented. This compensation decision includes an implicit normalization of the ecological and social in- and output parts to the economic dimension. This normalization is a key factor of our idealized model and we present some instruments to support this exercise in the next section.

Assuming that every ecological and social in- and output part is economically valued results in an explicit normalization to the economic dimension for all ecological and social in- and output parts. According to our definition that every economically valued part of the in- and output factors belongs to the economic part, the decision problem is reduced to a single dimension as presented in figure 1 right hand side. Therefore, every process modification with a positive improvement of the economic dimension should be implemented and leads to an improved sustainability of this process. This approach is identical to the internalization of external effects where every ecological and social part of the in- and outputs is interpreted as external effect. [11] The complete internalization of all ecological and social in- and output parts leads to increased process sustainability if the companies maximize shareholder value [6] in the long run.

There are two possibilities for the implementation of the economic valuation of ecological and social in- and output parts. For the implementation on company level each company has to value all ecological and social in- and output parts and include these values in each management decision. But the implementation at this level contains the problem of a potentially deliberate undervaluation of social and ecological in- and output parts. Companies have the incentive to undervalue social and ecological in favor of economic in- and output parts to increase their profits. If the valuation of these factors is not identical across all companies, companies with a lower valuation of ecological and social in- and output parts may have a competitive advantage against companies with a higher valuation of these parts.Over time this leads to additional incentives to undervalue ecological and social in- and output parts. This problem could be eliminated by the implementation of the valuation through a superior global instance. An implementation with globally standardized charges and premiums for ecological and social in- and outputs would internalize all externalities and as a result lead to more sustainable processes.

As the results of the Climate Conference in Copenhagen show, a global internalization of ecological and social in- and output parts is very hard to realize due to economic and political constraints. In the following we present some instruments, which – at least partly – contribute to solve the normalization problem on the company level.

4.2 Available Instruments

In the literature, more than 40 approaches are discussed, which consider corporate sustainability (e.g. [5],[12],[3]). Many of the existing approaches are isolated applications with respect to only one of the presented dimensions of sustainability where the majority of these approaches aims at the ecological dimension of sustainability [12]. In the field of environmental management, for example, some promising process-related approaches like the Life Cycle Assessment [13] approach can be found. However, an integrated view on sustainability necessitates the consideration of all three sustainability dimensions. [12] presents six approaches which comply with this integrated view. Three of these six approaches are especially applicable to all – and not just some – of a company's processes. In the following, we present the basic ideas of these three concepts.

EFQM-Sustainable Excellence model. The classical EFQM-Excellence model is a quality management system developed by the European Foundation for Quality Management (EFQM) to support organizations to be more competitive. The model represents a non-prescriptive concept for the self-assessment of organizations. The classical EFQM-Excellence model already contains dimensions of sustainability, but it has been complemented by social and ecological sustainability dimensions by the Sustainable Excellence Group (SEG) in 2003. Besides, the complemented model includes "know-how" and special procedures to implement sustainability into small and medium-sized organizations. The adjustments have been summarized in the EFQM-Sustainable Excellence model

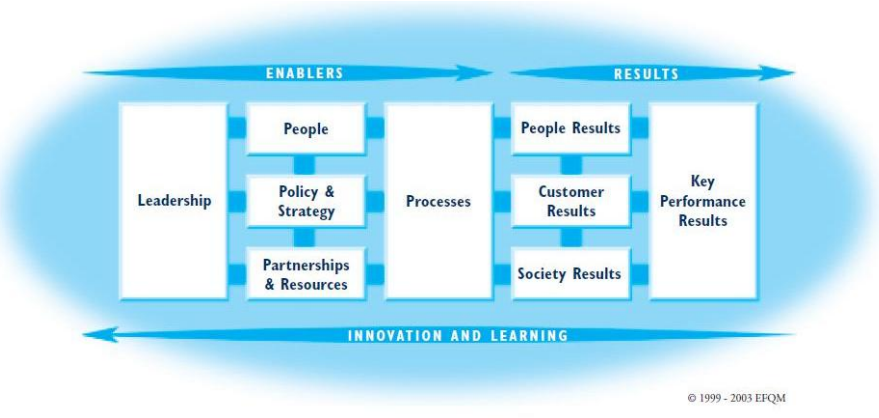

Fig. 2. Criteria of the EFQM-Excellence model [14]

(EFQM-SE model) [5]. Based on eight basic principles, nine criteria have been derived and for each of these criteria (see figure 2), a list of questions has been developed. Five of these criteria are "Enablers" and the remaining four are "Results". The enabler-criteria cover what an organization does, while the result-criteria cover what an organization achieves. "Results" are caused by "Enablers" and "Enablers" are improved using feedback from "Results" [15]. An organization's status quo on its way to sustainable excellence is determined by applying the so-called RADAR-Logic. RADAR means "Results", "Approach", "Deployment" and "Assessment & Review". By continuously iterating these four steps, an organization's strengths and potentials for improvement become visible [15].

For sustainable process management, the German Foundation for Environment promoted a project for the Benchmarking for sustainability (Be.st). In this project, based on the EFQM-SE model a tool has been developed to benchmark business processes. This tool considers business processes as an independent unit and thereby evaluates the processes on the basis of about 40 Questions (based on the nine criteria of the EFQM-SE model). With this method, the convenience and the focus on sustainability of processes can be assessed [16]. This method implies a certain process maturity and process orientation of the organization assessed. By applying the RADAR-Logic, points are assigned to the processes and concrete actions for process optimization are formulated [16]. The Be.st process assessment is a powerful tool to evaluate processes with respect to sustainability. By using the criteria of the EFQM-SE model ecological, economic and social dimensions of sustainability can be considered. Furthermore, the relevant stakeholders can be involved. It is possible to measure and compare a process' contribution to sustainability applying a point based system. By analyzing strengths and potentials, concrete actions to improve sustainability can be formulated. Yet the EFQM-SE model cannot consider interdependencies between the three dimensions of sustainability. Within the model, the ecological and social dimensions are not directly and explicitly related to an organization's success.

Indicator concept. Indicators are measures of performance containing condensed information. It can be differentiated between qualitative and quantitative indicators. Qualitative indicators are descriptive, whereas quantitative indicators are numerically measurable. To amplify the informative value and to reduce ambiguity, qualitative and quantitative indicators can be combined in indicator systems [12]. While quantitative indicators have been used to measure the financial profitability of companies ever since, qualitative indicators like customer satisfaction have become more and more important for companies [17]. Especially the ecological and social dimensions of sustainability contain many of these qualitative indicators [18]. For this reason, the consideration of quantitative as well as qualitative indicators is of great importance for measuring the sustainability of processes. One of the most established guidelines for the development of indicators to measure a company's contribution to sustainability was created by the Global Reporting Initiative (GRI) [19]. In their guidelines the GRI suggests 30 ecological (e.g. CO_2e gas emissions), 40 social (e.g. employee satisfaction) and nine economic indicators for measuring the contribution of the company's processes to sustainability.

Indicators are an adequate tool to measure the ecological, social and economic contribution to sustainability of (mainly less complicated) processes. Yet, indicators cannot consider the interdependencies between the three dimensions of sustainability. Concepts like the Sustainability Balanced Scorecard can integrate indicators and indicator systems to measure sustainability on the process level ([17],[12]).

Sustainability Balanced Scorecard. The Balanced Scorecard (BSC) formulated by Kaplan and Norton is a management tool to translate an organization's strategy into actions [20]. The BSC contains an indicator system that considers financial as well as non-financial quantitative and qualitative indicators. The qualitative and non-financial indicators are related to the financial indicators of the organization. Thereby they can be aligned to the long-term business performance (economic capital) of the organization [3]. The BSC differentiates four perspectives as shown in figure 3.

The four perspectives stand in a cause-effect-relationship to each other. For each of the perspective's goals, performance indicators, and actions to achieve the goals can be derived from the organization's strategy. The indicators used in the BSC concept can be split into lagging and leading indicators. The lagging indicators describe when the goals are achieved, whereas the leading indicators give information about how the goals can be achieved [18]. Because of the relationship between the perspectives, the lagging indicators of a subordinate perspective become leading indicators for the superordinate perspective. Due to the ability to consider quantitative as well as qualitative indicators, the BSC can be used in form of the Sustainability Balanced Scorecard (SBSC) to embed sustainability into the management processes of organizations [22]. If the reduction of CO_2e gases, for example, is part of the strategic goals of an organization, the

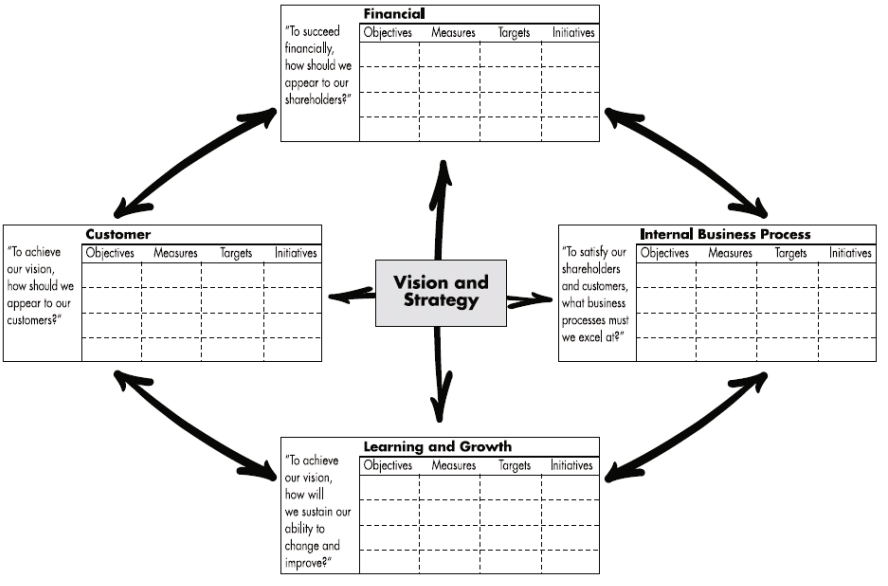

Fig. 3. Perspectives of the Balanced Scorecard [21]

maximum amount of CO_2e gases emitted can be a lagging indicator and energy efficiency can be used as a leading indicator. The more ecological and social dimensions are considered during the formulation of the corporate strategy, the more sustainability aspects gain relevance in management [22].

The traditional BSC concept aims primarily at the economic market environment whereas most of the ecological and social dimensions of sustainability are placed outside the markets, for example in society. The literature provides different approaches to integrate sustainability into the classical BSC concept [18]. To formulate a SBSC, basically, three steps are necessary. At first, the business unit has to be chosen for which the SBSC is to be formulated. Then the relevant ecological and social aspects and at last the strategic relevance of these aspects have to be determined [22]. Catalogues with potentially relevant ecological aspects are provided by [23], for example. The literature also provides catalogues of potential direct and indirect stakeholders, from which relevant social aspects for an organization can be derived [18]. The strategic relevance of the identified aspects is analyzed by classifying the identified aspects into lagging and leading indicators as well as hygiene-factors [22]. For larger organizations, a hierarchical concept of SBSCs is appropriate. From the BSC of the top level of the organization, subjacent scorecards for business units and business processes can be derived. This approach allows to break down the corporate strategy to the level of business processes [10]. For each Process Balanced Scorecard a so-called Sustainability Process Balanced Scorecard (SPBS) can be developed in analogy to the previously described procedure.

The SPBS provides a powerful tool for sustainable process management. In comparison to the EFQM-SE model, interdependencies between the three dimensions of sustainability can be considered. Yet, it can be used beneficially only if the corporate strategy is formulated with respect to sustainability aspects. Furthermore, because of the multitude of processes in organizations, only business processes with strategic relevance can be considered. In addition to that, this concept lacks the possibility to measure the degree of sustainability of processes and thereby to compare them to other processes.

4.3 Discussion

The idealized model illustrates that as long as a normalization to a unit of comparison is not possible, decisions on sustainability improvements may just be accidentally rationale and often may be even counterproductive when important consequences of the usage of specific input factors are not considered holistically. Certainly, revealing the complicated cause-effect-relationships between measures and their outcomes is a demanding task, but this is where research has been contributing over years and businesses have been innovative – often in a trial-and-error fashion.

The presented instruments may help in different ways to improve the sustainability of an organization through a better design of business processes. If the implementation and maintenance of these instruments came at no costs, the usage of all three seems advisable. Rooted in total quality considerations the EFQM-SE model primarily helps at identifying processes that should be improved, while the indicator list by the Global Reporting Initiative supports in selecting a few relevant indicators to measure a process' status quo and respective improvements. Still both of these instruments do not support a decision maker in balancing improvements and worsenings in and between different sustainability dimensions that are rooted in theory. It remains more the "gut feeling" or "strategic considerations" that may guide these decisions. This problem may be partially solved when implementing a BSC concept and using specific SPBSs for the management and controlling of each relevant process in the organization. However, even though the BSC concept explicitly considers the relations and interdependencies between different perspectives, dimensions and indicators, it does not provide for clear guidance of how to select the "right" indicators. Thus, the challenge of identifying the relevant cause-effect-relationships remains prevalent. But at least, over time an implemented BSC concept will show whether the assumed relationships are tendentially correct.

To make things worse, the implementation and maintenance of the described instruments require considerable resources and the business case for these investments has still to be made. However, most companies already have some management concept – quite often the BSC concept – in place. Hence, the investment to integrate sustainability governance into a corporate governance concept may be less expensive compared to a stand-alone implementation.

5 Summary and Outlook

Sustainability in our everyday life as well as in business gained in importance in recent years. As discussed in this paper, IT has a great potential to contribute to corporate sustainability. While the widely discussed "Green-IT"-concepts can make a modest contribution to sustainability mostly on an infrastructure level, the highest potential for sustainability improvements lies in the comprehensive use of IT to enhance the efficiency of business processes. We find that the implementation through globally standardized charges and premiums for all externalities seems to be the best way to incorporate all dimensions of sustainability into management decisions. As the results of the Climate Conference in Copenhagen show, such a global solution cannot be expected in the near future. Yet, there exist some instruments to incorporate sustainability into the management process on the company level. Companies still have to balance costs and benefits of the implementation and usage of these instruments. Moreover, the available instruments focus primarily on the measurement *or* management of sustainability on the process level but hardly provide for any guidance with respect to the actual necessary process (re-)design in detail.

Numerous perspectives for further research arise from our analysis. The cause-effect-relationships between the three dimensions of sustainability need to be further investigated to understand how they can be normalized to the economic dimension. This is also a necessary requirement for an implementation of sustainable process management through charges and premiums on a global level. Furthermore, the presented instruments may serve as a starting point for the development of an integrated management concept that covers all three dimensions of sustainability on the process level. Such a management concept should also comprise an adequate decision support for design choices when redesigning the processes in order to improve sustainability. This could also result in enhancing existing reference models for process design with respect to sustainability considerations.

References

1. Gore, A.: Our Choice. St. Martin's Press, New York (2009)
2. Buhl, H.U., Laartz, D.J.: Warum Green IT nicht ausreicht - oder: Wo müssen wir heute anpacken, damit es uns übermorgen immer noch gut geht? Wirtschaftsinformatik 50(04), 261–264 (2008)
3. Burschel, C., Losen, D., Wiendl, A.: Betriebswirtschaftslehre der nachhaltigen Unternehmung. Oldenbourg Wissenschaftsverlag, München (2004)
4. World Commission on Environment and Development: Our Common Future. Oxford University Press, Oxford (1987)
5. Fischler, U.: Corporate Sustainability. VDM Verlag Dr. Müller, Saarbrücken (2007)
6. Rappaport, A.: Creating shareholder value: A guide for managers and investors. Rev. and updated. Free Press, New York (1998)
7. Kolbe, L., Zarnekow, R., Schmidt, N.H., Erek, K.: Nachhaltigkeit und Green IT in IT-Organisationen. Technical report, Georg-August-Universität Göttingen; Technische Universität Berlin (2009)

8. McKinsey: SMART 2020: Enabling the low carbon economy in the information age. Technical report, The Climate Group and McKinsey (2008)
9. Becker, J., Kugeler, M., Rosemann, M.: Prozessmanagement: Ein Leitfaden zur prozessorientierten Organisationsgestaltung. Springer, Berlin (2005)
10. Schmelzer, H., Sesselmann, W.: Geschäftsprozessmanagement in der Praxis. Carl Hanser Verlag, München/Wien (2006)
11. Pindyck, R.S., Rubinfeld, D.L.: Microeconomics. Pearson Education, New Jersey (2009)
12. Schaltegger, S., Herzig, C., Kleiber, O., Klinke, T., Müller, J.: Nachhaltigkeitsmanagement im Unternehmen. Technical report, Universität Lüneburg (2007)
13. Klöpffer, W., Grahl, B.: Ökobilanz (LCA) – Ein Leitfaden für Ausbildung und Beruf. Springer, Heidelberg (2009)
14. EFQM: Excellence einführen (2003)
15. EFQM: EFQM Excellence Model. Technical report, European Foundation for Qualitymanagement (2003)
16. Merten, T., Baur, A.: Nachhaltigkeitsorientierte Selbstbewertung von Geschäftsprozessen. Technical report, future e.V.
17. Jankulik, E., Pfiff, R.: Praxisbuch Prozessoptimierung. Publicis Publishing, Erlangen (2009)
18. Figge, F., Hahn, T., Schaltegger, S., Wagner, M.: Sustainability Balanced Scorecard - Wertorientiertes Nachhaltigkeitsmanagement mit der Balanced Scorecard. Universität Lüneburg (2001)
19. GRI: G3 Leitfaden zur Nachhaltigkeitsberichterstattung. Web ressource (2006)
20. Kaplan, R.S., Norton, D.P.: The Balanced Scorecard: Translating Strategy Into Action. Harvard Business School Press, Boston (1996)
21. Kaplan, R.S., Norton, D.P.: Using the Balanced Scorecard as a Strategic Management System. Harvard Business Review (07-08), 75–85 (1996)
22. Hahn, T., Wagner, M.: Sustainability Balanced Scorecard - Von der Theorie zur Umsetzung. Universität Lüneburg (2001)
23. Heijungs, R., Guinée, J., Huppes, G., Lankreijer, R., de Haes, U.A., Wegener Sleeswijk, A.: Environmental life cycle assessment of products: Guide. Technical report, Centrum voor Millieukunde, Leiden (1992)