ICT-based Sustainability Planning and Management Support for SME

Nils Giesen

Abstract

This contribution will give an insight on a methodical framework for ICT-Driven sustainability planning and management support with a focus on the needs and requirements of small and medium enterprises. In particular, the opportunities, influences and importance of modern SMEs are taken into account [1]. In those environments, sustainable planning processes and management support combined with a controlled economical, ecological but also social acting [9] are of increasing importance for all participating associations. A balanced and legitimated commitment plays an important role for environmental as well as for social orientations of those companies [2]. In order to enable companies to act entrepreneurial in a way, that following generations can satisfy their own needs in the same dimensions as current generations, those companies need to be provided with assistance in management of processes, aggregation of information and conduction and communication of activities (s.f. [14], [5] and [15]). In all of these activities ICT-based systems play an important role and can be of essential significance (e.g. [11], [12] or [4]), not only for disastrous and unwanted events (e.g. [10]), but also in order to manage different events with focus on sustainability.

1. Introduction

Even if sustainability nowadays is regarded by small and medium enterprises as a key competitive factor, individual measures are being implemented primarily due to customer wishes. In addition, most rules of conduct are not held or defined but mostly they be lived informally and unstructured [3]. By assisting and guiding SME towards a more sustainable development, different ICT-Methods and components can be combined to a powerful methodical framework. The major task of such a framework should be assisting in continuous activities and processes, realising the applicability of strategic instruments for sustainable development. The design and usage of (components of) the framework should not be an end in itself, rather it should be used to archive the self-set environmental and sustainable targets and politics of each SME Therefor a structured catalogue of suitable methods has been established [8].

With this contribution a detailed insight into the methodological and generic structure of the mentioned framework will be provided. Within the steady expansion of the framework several application scenarios have already been identified and validated by the implementation of corresponding prototypes. Here, the focus was always on the strategic aspects of decision support. A first prototype implemented aimed to support the planning phase of regional projects, under influence and considering sustainable development and mutual interactions of activities [7]. A further application was given in a corporate oriented support system for management control of SME, focused mainly on inside usage and implementation [13]. One of the underlying methodology was used to support decision making in the field of simulation and analysis of material flows ([6]). Furthermore the contribution will reflect the results of those different implementations in order to carry out an assessment of the individual elements of the framework to improve the usability for upcoming use-cases and scenarios.

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It is not intended to be create competitive situations, rather the (support of) elementary points as strategic management and internal goals should be prioritized than the additive activities of environmental certifications or sustainability reporting.

2. Sustainability for SME

Small and medium sized companies are not always able or willingly to implement a complete large scale (external driven) environmental policy or management and audit system. In addition, hosting and maintaining of complex environmental management information systems would blow up the existing financial framework for ICT-related investments. Nevertheless should they be able to measure their own sustainability related impact and development in order to obtain a reliable base for future decisions. This sets up the demand for a light-weighted, flexible and adaptable approach for a sustainability oriented decision support framework, based on existing ICT-Methods and components.

2.1. Sustainability Planning

Planning under the main principle of sustainability has to follow two major aspects in the planning activities: (open) communication and comprehensible and documented processes. While existing guidelines to planning and especially project planning activities are mainly focusing on support while already conducting the considered subject, sustainable planning needs an earlier and more strategic viewpoint on all upcoming activities to be conducted seriously.

In addition, there should be differentiated between sustainability planning and the planning of a project for a sustainable development. While the latter has already a focus on sustainability from itself and the initial activities, sustainability planning aims on guiding all planning decisions of any activities under the main principle of sustainability. An example for a better understanding could be the distinction between the planning for the constructions of a new harbour against the planning of a low emission industrial area. While both approaches have heavy influences on their surrounding environments and society as well as a heavy economic impact, an initial balancing between this criteria and the contemplated target course may heavily differ between these ideas.

For all possible planning activities, some common aspects can be summarized, to describe the initial outline as well as the targeted results. These aspects are relating on the activities as well as on the surroundings, in order to cover these activities in the sustainable development. Further existing frame conditions (“what should happen for whom and why”) for the activity, temporal and spatial dependencies have to be included in the planning processes. These information give one part of the required base information. The second part is a clearly communicated set of requirements and indicators to rate the activity. Each individual indicator should be clearly connected to one of the overall fields of a sustainable development, to cover economic, ecologic and social aspects as well. Any given support can now use these information to lead to a, sustainable influenced, decision for the planning. The approach described in this contribution favours an ICT-driven approach using a multiple-criteria decision analysis (MCDA) for the planning process. A simplified overview of all mentioned aspects can be seen in figure 1.
Besides the sustainable planning of a given activity, an overall sustainability management should be considered of high importance for small and medium sized enterprises. While existing frameworks and management schemes are not only very complex, the often targeted at and for the demands of enterprises and require substantial input from different fields (e.g. required information, labour time, personal, licence costs, internal and external survey…) and are not suitable for small and medium enterprises. Instead of implementing new systems (technical or methodical), the existing potential should be used to “implement” a sustainability management with the use of well-known and controllable methods and systems of the SME. A guided selection of different strategic instruments can be used inside an activity flow for sustainability management. An excerpt of possible instruments and application spectrum listed in [8] can be seen in table 1.

### Table 1: analytical, implementation and communication aspects of existing instruments for a sustainability management

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Analytical</th>
<th>Implementation</th>
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<th>Ecological</th>
<th>Social</th>
<th>Economical</th>
<th>Role of Integration</th>
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</table>

Figure 1: planning aspects from different phases of the sustainable planning process

### 2.2. Sustainability Management

Besides the sustainable planning of a given activity, an overall sustainability management should be considered of high importance for small and medium sized enterprises. While existing frameworks and management schemes are not only very complex, the often targeted at and for the demands of enterprises and require substantial input from different fields (e.g. required information, labour time, personal, licence costs, internal and external survey…) and are not suitable for small and medium enterprises. Instead of implementing new systems (technical or methodical), the existing potential should be used to “implement” a sustainability management with the use of well-known and controllable methods and systems of the SME. A guided selection of different strategic instruments can be used inside an activity flow for sustainability management. An excerpt of possible instruments and application spectrum listed in [8] can be seen in table 1.
2.3. ICT-driven Approach for decision support

To conduct the planning process in a comparable and comprehensible way, a generic methodology is needed. The used PRECC methodology is taking into account the concept of having different independent groups of stakeholders taking part in the decision process as well as an focus in ICT-driven or ICT-supported methodologies [6].

Such an ICT-driven approach for decision support can be divided in five activity phases, which should be conducted sequentially and furthermore in an iterative manner. Figure 2 gives an overview of the five phases of PRECC:

The planning phase as initial phase of PRECC covers the basic foundations of all following phases. By defining the activity with the aspects in figure 1 an ICT-driven implementation can be set up following the planning phase. The second phase, rating, can be implemented open in a way, where different rating schemes and different weighted sets can be used by different stakeholders, showing the importance and impact of different indicators and values. The evaluation phase provides a view into the results of different MCDA-based approaches and provide a first ranking and possible action fields for the planned activity. The iterative approach of PRECC is closed by a comparison and a communication phase. While the first is mainly targeted for all involved decision manager, the second one is aimed at all involved stakeholder. The results of the comparison and communication phases should be used to start the iteration process and influence the planning of further activities.
3. Methodical Framework

Figure 3 gives an insight on the methodical framework which was used to develop the software prototypes for ICT-based sustainability planning and management support systems:

The framework includes three major areas: Instruments, Functionality and Administration. Each Area has subitems to be used either from existing software or from easy to adapt and maintain.

Figure 3: Sustainability Planning and Management Support Framework
external providers. The mixture of ICT-based and methodology based elements aims to reduce the overall amount for an implementation. This will allow an integration to the existing corporate information system landscape over the interfaces, making all available information usable. Combinend single-sign-on/user administration functionality also aids in this process. Further external processing can be used for industry wide comparison (e.g. categorization/grading) if stakeholder demands are existing.

4. Prototypes

The methodical framework was used to and extended by two different prototypes, who will be described shortly in the following chapter. More details and access to the prototypes can be given on request by the authors.

4.1. ProPlaNet

ProPlaNet is an example for a web based software system which includes a project planning tool, the public interest, using a multi-criteria-decision-analysis (MCDA) to support the decision making process, for the rating of regional projects – Under consideration of the credo of a sustainable development.

The fundamental aspects of the approach are measuring sustainability (indicator based), the current state and development of a region, the effects of projects and comparison of project alternatives with a focus on quality management for data integration and user management as well as e-participation for the overall process.

ProPlaNet was one of the first derivations of the framework, proving the general possibility of technical implementation and been applied to several use cases for regional impact projects. Realized use-cases have been tested from large-scale activities (e.g. identifying renaturation areas for mangrove woods) over regional-scale (impacts of different highway lines) to small-scale activities (e.g. building renovation / room use scenarios) – depending on the available data sources. One impact for the framework from ProPlaNet was the goal to reduce the dependency from external data sources for planning activities.

4.2. Sinister

Sinister is a prototype to develop a strategic instrument for developing a sustainable enterprise and aims at small and medium sized enterprises (s.f. [13]). Under consideration of the core areas of supporting strategic decisions, including sustainable supply chains and to raise the efficiency of production processes this prototype supports with ICT-based tools for visual analysis, reporting, decision support, data and system integration and geographic analysis and information systems.

Sinister is a proof-of-concept for a light-weighted stand-alone software solution with interfaces to external and internal data sources. Possible scenarios include the integration of external data (e.g. via web service from of federal statistical offices) and internal data (e.g. from an ERP-system) to combine these information to identify new production or market possibilities. While the technical implementation was successful, the usability and process running need to be improved. Nevertheless, the results could be used to further improve the framework.

5. Outlook and Conclusions

By providing a framework with low “resource” and complexity requirements, a major benefit for SME could be provided. By applying one of the prototypes or a further implementation of the framework, the companies benefit from direct visible and usable information and decision support for all sustainability related issues. They can combine internal and external data and adapt to a sustainable development without investing critical resources (personal, time, money…) to large-
scale software or management installations without knowing what output could be used. Further development on the framework will be conducted as well as a more detailed information of the framework and its details itself will be published.

References


