A Target System for the Introduction of IT-based Sustainability Management in Companies

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***Abstract*— Sustainability is a fundamental issue for companies, especially for Small and Medium-sized Enterprises (SMEs). A key challenge for the realization of sustainability is its complexity and multidimensionality. The content of this paper is a target system in which the field of sustainability is broken down to a level that is manageable for SMEs. By means of a hierarchy of the target system, dependencies between goals are made transparent and prioritization is made possible. The target system consists of eight key objectives and sixteen accompanying targets that concretize the Triple Bottom Line. The approach enables SMEs to take sustainability-relevant aspects into account in a targeted and structured manner.**

Keywords-digital transformation; target system; sustainability management; energy management

I. INTRODUCTION

Rising awareness of sustainable business practices in the corporate world can be observed [1][20]. On the one hand, companies are motivated to establish a strategy for sustainable management due to regulations, e.g., taxation benefits for sustainable companies. On the other hand, customers call for change and reward sustainable products by increased willingness to pay [2].

Often, a company's first approach to sustainability can be found in energy management. Governments are also aware of the significance of energy management. In practice, Energy Information Systems are used for tasks related to energy management. Target systems that support companies selecting a suitable software for their needs are the origin of the target system described in this article. Thus, a significant part of the target system is referring to energy management.

The article is structured as followed: Section 2 describes the state of the art, section 3 the approach, and section 4 the conclusions.

II. STATE OF THE ART

In this section, information regarding sustainability and target systems, in general, is provided. In addition to governments and NGOs, companies also need to play an active role to tackle global problems, such as climate change and social inequality. They are expected to play an active role. According to the triple bottom line approach, sustainability considers economic, ecological, and social aspects [3]. After [3], the founder of this approach, companies that pay attention to both ecological and social aspects can determine a positive effect on economic development, such as better access to new customers due to improved reputation regarding sustainability [4]. The Sustainable Development Goals of the United Nations (UN), which include, e.g., Climate Action or Reduced Inequalities, can serve as a further point of reference for companies, even if the goals are originally intended to address the member states of the UN [5]. The more globally a company operates and the larger its influence, the more goals are relevant. The Global Reporting Initiative is an independent, international organization, which aims to support companies when it comes to the preparation of sustainability reports [6]. Another initiative is the WIN-Charta of the German state of Baden-Württemberg, which can be described as a regional response to the global trend towards sustainability. The provided guiding principles are closely correlated to the SDGs and thus also build on the Triple Bottom Line [7].

Entrepreneurial action is characterized by constant decisions to maintain profitability. Concrete goals and their regular monitoring make it easier to determine the progress of management measures, as well as to derive improved options for action. Often it is necessary to prioritize goals, thus a target system can facilitate this prioritization. One approach of target systems is the Goal-Means-Thinking

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approach of HABERFELLNER, which defines a multi-level effect system [8]. The author distinguishes goals and means, where means serve as a solution for the goal above them on the one side, whereas the means represent a goal for the next subordinate level as well.

Another approach is the Plural target system according to SCHEIBLER [9]. Plural target systems have such key objectives which are free of conflict among each other. A key objective is a top-level goal in the system, for example, profit maximization. There are two levels below filled with subordinate goals that are derived from the guiding goals. Only the integration of the lower levels, i.e., contradiction-free, supply to superordinate goals constitutes a well-structured goal system [9].

III. APPROACH

The procedure for creating the target system is divided into three steps according to [3]. First, a target set is identified through desk research and analysis of relevant literature. The objectives of this set are abstracted based on measures, advice, and best practices cited in the literature, checked for relevance to SMEs, and summarized in case of overlaps. Then, complementary, or conflicting cause-effect relationships between the objectives are derived factually. Subsequently, the conflicting goals are mapped using HABERFELLNER's goal-means thinking in such a way that there are no longer any conflicting relationships between a leading target and the subordinate target. Finally, the hierarchical target system is transformed into a plural target system according to SCHEIBLER [9].

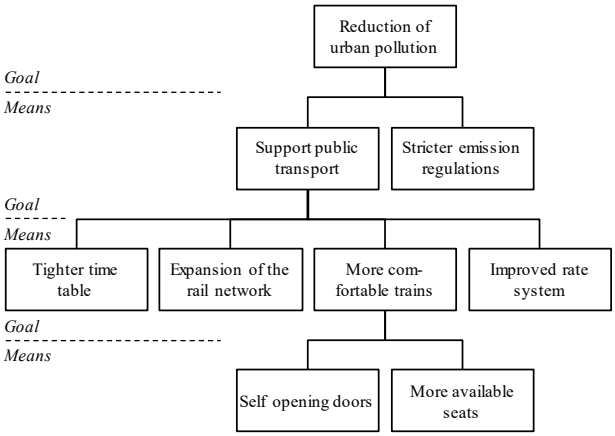

Figure 1. Structure of the target system

An example for a target system is shown in Figure 1. It combines several targets in a hierarchical structure by the goal-means-thinking by HABERFELLNER.

A. Economic dimension

One of the top priorities of entrepreneurial activity is to perpetuate high profitability, which is why it has found its way into a key objective. In addition to pure profitability, customer loyalty is the key to the long-term success of a company.

In economic terms, the main objectives listed are those aimed at reducing costs or ensuring the long-term existence of a company on the market through strong customer loyalty.

Increase profitability: The objective can be divided into two accompanying objectives.

Reduce risks in energy and raw material supply: This accompanying target is associated with the term resilience. Every manufacturing company depends on a reliable supply of energy and raw materials. Bottlenecks in the procurement of raw materials can bring production to a temporary standstill, and interruptions in the energy supply can cause additional damage to machinery and equipment. In either case, negative consequences for profit prospects must be expected.

Reducing energy and resource procurement costs: Expenditures for energy and resources account for almost half of total costs in the manufacturing sector. Other costs such as wages, depreciation, and amortization are less significant. To increase profitability, measures must therefore be taken to achieve cost efficiency in energy and resource procurement.

Expanding customer loyalty: Two accompanying targets are assigned to the key objective "Expand customer loyalty".

Improve image: A positive image has paramount importance for companies. The interaction of the three pillars of sustainability can be seen here. Even small efforts, such as publishing image brochures on the social and ecological commitment performed, can improve the image and contribute to economic success [10].

Increase customer satisfaction: The basis of stable customer loyalty is customer satisfaction [11]. All parameters during the contact between company and customer as well as the product's life cycle contribute to customer satisfaction. Starting with reliable and accurate information, a company's sphere of influence extends from pricing to after-sales service.

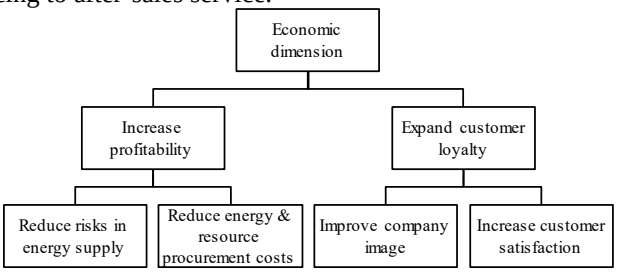

Figure 2. Economic dimension of the target system

B. Ecological dimension

Ecological aspects are prominent in the perception of sustainability. Sustainable ecological action encompasses

many aspects, such as emissions. The central goal is a general reduction in environmental impact.

Optimize energy use: Making energy use sustainable means energy that is based on sufficient availability of suitable resources, while negative impacts are limited [12].

Minimize energy use: The most effective way to reduce CO2 emissions is to consistently diminish energy use. Less energy use means less environmental impact, and companies also benefit from lower procurement costs. A detailed examination of the energy flows and the associated costs of a business unit is possible.

Ecologize energy use: While it is important to use as little energy as possible, there are also limits to the scope of energy-saving measures. Efforts must therefore also be made to ensure that the energy usage is as environmentally friendly as possible.

Optimize use of resources: Optimizing the use of resources can be realized by the efficient and environmentally compatible use of materials and production goods.

Minimize resource use: Efficient material streams not only protect the environment, but also contribute to lower procurement costs. In addition, further savings are possible due to lower waste and reduced expenditures for further environmental protections, i.e., with innovative environmental technology.

Ecologize resource use: Regarding resources, companies can also strive for more eco-friendly solutions. The use of alternative or recycled raw materials offers numerous possibilities for acting.

Reduce environmental impact: To maintain or improve the current state of the world, a sustainable increase in energy and resource productivity is necessary. Furthermore, there is a need to limit the environmental impact caused by humans.

Minimize negative consequence: Climate and environmentally neutral production are a vision that requires a considerable number of further efforts. A key measure that can be expanded iteratively is to minimize the negative consequences of a company's production activities.

Create positive environmental impact: Another accompanying target of the ecological dimension offers companies numerous opportunities for action to go beyond reducing their ecological footprint and strive for targeted measures for a healthy environment.

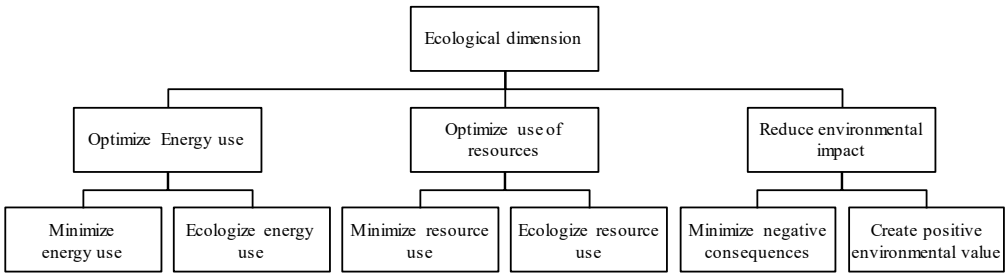

Figure 3. Social dimension of the target system

C. Social Dimension

By pursuing social goals many companies can also determine economic benefits. Social commitment improves the brand image and can thus lead to higher sales.

Promote health and safety: Employees of manufacturing companies in particular are exposed to a variety of health risks - for example, through the accumulation of problematic pollutants [12]. Thus, high motivation to perform occupational health management is given. Companies that actively care for the health of their employees are able to retain qualified employees in the company [13].

Ensure good working conditions: Employees in manufacturing SMEs complain about stress, strain due to static posture and noise. Measures are therefore required to ensure health and safety at the workplace, i.e., the establishment of a medical expert [14]. To also ensure the mental health of employees, efforts to ensure a pleasant working atmosphere and regular reviews of employee satisfaction are needed. In the future, concepts for work-life balance will be needed, enabling suitable working time models.

Provide a contractual framework for protection: Companies can protect employees by striving for long-term contracts, as employers feel financially secured and work in a stable environment. Since the search for new employees is a cost driver, it is worthwhile for companies. Extensive transparency regarding the pay structure also avoids potential conflicts. Added benefits for employees that go beyond monetary compensation increase employee satisfaction and strengthen the attractiveness of the employer in terms of employee acquisition. For example, companies can offer leasing models for company bicycles, or subsidize gym fees.

Seek participation and transparency: To ensure long-term identification of the employee with the employer, companies need to encourage employees to participate in sustainability-related topics. The focus of this key objective is the collaboration within the company across different hierarchical levels and includes the involvement of external interest groups.

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Increase organizational candor: Clear communication channels and sufficient feedback are elementary factors for employee satisfaction. Feedback should be given in both directions. Candor and extensive conversations result in a high level of job satisfaction; employees are motivated, there is less willingness to change jobs, and employees have a greater interest in the further development of the company [15]. In addition, management must grant all employees the same possibilities and opportunities.

Strengthen employee involvement: Employees who experience a high degree of responsibility, competency, self-determination, and influence are also more satisfied with their work and identify more strongly with the company. Further positive consequences are increased productivity, performance, and innovation [16]. Not only large corporations but also SMEs can share the company's success with their employees. For example, a company will motivate its employees by sharing a percentage of the profit.

Enhance empowerment and cooperation: Not only do in-house training programs contribute to a sustainable employee base, but also external engagement that supports individuals enhances employer reputation.

Support people by corporate activity: Apprenticeships provide companies with qualified specialists who are capable of manufacturing high-quality products and offering sophisticated services. In this way, companies can counter the shortage of skilled workers at an early stage. Regular training also creates greater value for companies. Lifelong learning across all employee groups as well as individual and flexible training measures increase employee productivity and thus contribute to innovative strength and competitiveness [17]. Internal disputes and competing departments cause a shift in the focus on value creation. A harmonious interaction among employees is the basis for a good working atmosphere.

Support people beyond the company: Corporate giving is not yet very common among SMEs. Corporate giving is done above all to improve a company's image. Hence, a positive economic correlation has been proven between the extent of corporate giving and the company's success [18]. For smaller companies, topics with a regional or local connection are particularly suitable [19]. Furthermore, investment to individuals can be made.

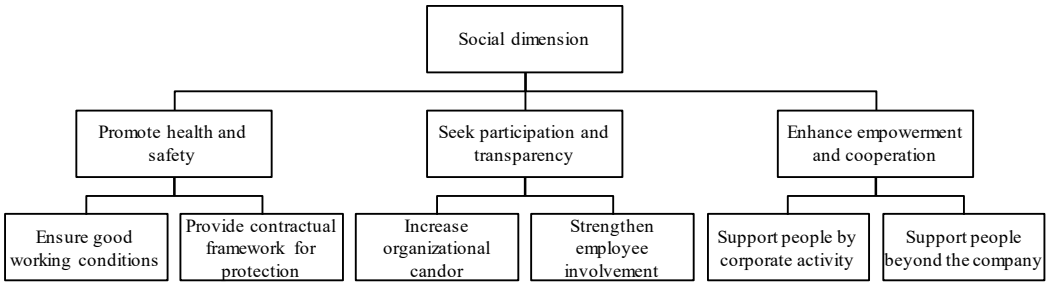

Figure 4. Social dimension of the target system

IV. CONCLUSION

Considering the increasing relevance of sustainability in society and industry, companies see an obligation to act. SMEs are asked by large companies to meet sustainability criteria, in particular, because of their role as a supplier. Hence, the scarce personnel and investment capacities of SMEs must be directed towards this topic to a greater extent in the future. To implement sustainability management on a systemic level in the company, information systems, especially energy information systems (EIS), represent a logical starting point.

EIS provide functionalities that can also be used for other sustainability use cases. This offers enormous opportunities due to data-driven decision-making.

Based on extensive literature research, a target system is presented, that companies can use to prioritize different targets. These targets can be used to define necessary features of EIS and define the necessary scope of IT-based sustainability management.

Further research is needed to examine different software solutions for monitoring success in terms of their functions and relations to the goals specified in the target system. To achieve a level of complexity that is manageable for SMEs, software providers offering modular system worlds are a promising area of investigation for further research work.

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