



Sustainability Driving Innovation and Value Creation

In the future, successful innovations will need to anticipate the challenges of sustainability and new kinds of „scarcities“. Optimizing enterprise processes will become critical and will free company resources, which can be invested in sustainable innovations affecting both the bottom and the top line.

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After a remarkable public debate about sustainability a few years ago, following important milestones such as the reports of the Intergovernmental Panel on Climate Change or Al Gore's „An Inconvenient Truth“, the prevailing financial crisis of these days seems to have displaced public concern about sustainability. However, one can well argue that a sustainable development remains one of the biggest challenges of the 21st century. There is a long list of unprecedented issues of global

relevance, most of them with a negative trend: the depletion of natural resources, the deforestation of tropical rain forests, shortages in food and water supply and increased social tension and political instabilities in many regions around the globe, and above all global warming, which seems to be happening even faster than pessimists predicted.

The current financial crisis is a symptom of the same kind of non-sustainable approach which causes other challenges: We are

piling up huge debts – at the expense of the environment, and at the expense of future generations. As Joseph F. Keefe, President of Pax World Funds, an investment company focusing on sustainable investing, puts it: „In fact, the sustainability crisis and the financial crisis are related in that they both result from an excessively short-term focus that is costing us dearly“ [10, p. 4].

Reacting to the recent developments on the financial markets, politics and civil society are seeking ways to implement a long-term orientation into the markets. The initiatives for a financial transaction tax, the Occupy Movement, or the prohibition of naked default swaps in Germany are just a few examples of this kind. We are likely to see more measures of future-oriented policies to come.

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Scarcities – increasing in number and severity

The global challenges mentioned will increase the severity of scarcities and introduce new kinds of scarcities into the market system (mainly by political measures) with significant impacts on businesses. A study of the World Resource Institute examining the effects of environmental change on business indicates that failure to adjust to changing conditions could cost companies up to 47 % in earnings until 2018 [21, p. 26].

1. Natural resources have lately experienced sharp increases in price and volatility due to an increasing global demand, finite amounts available, and speculation. This trend will not only continue but intensify in light of a growing global population and growing middle classes in emerging economies. Increased resource prices and/or their hedging will incur additional operative cost for companies.

In a recent survey of executives and thought leaders in the area of corporate environmental strategy and performance 76 % of the respondents said that they anticipate their company's core business objectives to be affected by natural resource shortages in the next three to five years [7, p. 22].

2. For a long time, common goods like clean water, fresh air and a well-balanced climate have not been included into the market system; they were seen as externalities. In other words, they were not accessible to market mechanisms. This situation is changing. The number and depth of environmental regulations is increasing around the globe. Cap-and-trade mechanisms like the European Union Emission Trading Scheme for greenhouse gas emissions attribute

costs to a good which did not have a price previously. By these measures, authorities introduce an artificial scarcity into the market.

Cap-and-trade mechanisms are said to be effective, similar to taxes like the ones introduced in Australia in 2012. Despite some discussion around the usefulness and effectiveness of such regional initiatives in a global market, one can hardly deny the substantial implications for businesses. For some industries, like transportation and logistics, carbon emissions will practically become a second currency, since every ton of reduced carbon emissions equals a certain monetary benefit.

3. A third kind of scarcity due to the challenges of sustainability arises from the banning of certain substances (e. g., Substances of Very High Concern (SVHC) as defined in Article 57 of the REACH Regulation). The respective regulatory measures affect the operating costs mostly indirectly. Environmental regulations like REACH, WEEE, or RoHS pose significant administrative requirements for the process industries or high tech and incur additional administrative costs.

4. Yet, sustainability and its challenges do not only incur additional cost and effort, they also open new market opportunities. As markets mature, one can see a trend towards „sustainable products“, evidenced by eco labels such as MSC, FSC, EU Eco-Label, Energy Star, fair trade, and many others. Conscious consumers are willing to pay a premium for such products, indicating that goods which were formerly not included into market mechanisms (like sustainably caught fish) are now prized and priced. LOHAS – people with Lifestyles Of Health And Sustainability – have even become a market segment of their own.

Scarcities driving innovation

Often in history, scarcities have driven innovation. Scarcities of labor and resources, for instance, have led to increased productivity. This relationship between scarcity and innovation has been discussed for decades, starting with John Hick's theory of induced technological change in the 1930s: changes in the relative prices of production factors create incentives for additional innovation efforts regarding the production factor which has become relatively more expensive. In other words, by means of triggered innovations, rising prices for resources lead to increased resource efficiency [4, p. 275].

The relationship between resource prices and incentives for innovation has often been investigated, for instance in the case of the relation of energy prices and patent filings. David Popp conducted a study in which he used U.S. patent data to analyze the impact of energy prices on energy-saving technologies. He concluded that higher energy prices give incentives

for energy-saving technologies and trigger corresponding patent filings. He concludes that there is a „strong, positive impact energy prices have on new innovations“ [14, p. 178].

According to a recent OECD study „environmentally related taxes can provide significant incentives for innovation, as firms and consumers seek new, cleaner solutions in response to the price put on pollution“ [13, p. 3]. In light of this relationship between scarcities, innovation, and sustainability, and in light of ambitious targets for environmental performance in many countries, it is likely that regulators will introduce even more new kinds of scarcities into the market. Businesses should therefore anticipate these upcoming scarcities and optimize consumption of the related resources at an early stage.

Bottom line and triple bottom line

More than a decade ago the term „triple bottom line“ was introduced to indicate that companies have to consider not only their financial results, but also their impact on the environment and society [5]. The establishment of a global framework for sustainability reporting by the Global Reporting Initiative and the exponential increase in corporate sustainability reports to close to 6,000 worldwide today shows that many companies have understood their stakeholders’ request for more than mere financial information. However, critics complain that those sustainability reports are not sufficiently related to financial reports, and that their value for a realistic assessment of the triple-bottom-line performance of the company is very limited.

One way to add weight to non-financial performance indicators is to calculate and report their financial equivalents. Although the concepts and metrics of such an environmental accounting, and even more of social accounting, are not as mature as for the financial accounting and are still being developed, first attempts have been made. PUMA issued the first environmental Profit & Loss account in 2011 and calculated the environmental impact of their operations, including their suppliers [15].

This pioneering work was widely noticed and well received by many groups within the Corporate Sustainability community. However, despite such pioneering projects and the rapid increase of reports on sustainability, triple-bottom-line accounting is still a vision for the future. Until that vision will be realized and all relevant financial and non-financial indicators are included into standard corporate accounting and reporting, it will be important to point to the financial implications of corporate sustainability. In the following section the authors argue that even in financial terms there are good reasons for corporate sustainability. Initiatives for corporate sustainability affect both the bottom and the top line of businesses and have a great potential to generate economic value.

Optimizing enterprise resources will become even more important

The effective and efficient management of enterprise resources has long been the role of Enterprise Resource Planning (ERP) systems. Whereas traditionally ERP systems focused on the optimization of financial resources, new and rising scarcities will necessitate broadening the balance sheet and considering other kinds of resources. In this context, business applications like ERP systems need to provide informational transparency and enable the measuring, tracking, and reporting of sustainability performance as well as the compliance with legal regulations. The efficiency gains, cost savings, and risk reductions will free company resources, which can, in turn, be invested

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in innovation and development for sustainable products. We will use the value tree as a way to structure the case examples and thereby illustrate the power of information technology in increasing corporate sustainability, i. e. to increase economic value as well as environmental benefit.

There are three major aspects to be taken into consideration:

Cost – cost savings and efficiency measures which reduce the consumption of resources, improve resource productivity and result in margin improvement for the company.

Competitiveness – measures that are making the company’s products and services more appealing to customer needs, stir revenue growth and open the potential to enter new markets.

Compliance and Risk Management – which does not only mean to reduce the risk of non-compliance, but also to avoid costly mishaps and accidents and thereby to ensure access to markets as well as capital.

Cost – IT driving enterprise resource optimization

Transparency and insight into the status quo are the first steps towards improvement. Enterprise software can help providing improved insight into the use of resources in manufacturing settings, such as raw materials and energy. The following two case examples illustrate different dimensions of this topic:

- Transparency is a prerequisite for energy savings and resource efficiency, yielding bottom-line results, as can be seen in the case of Valero Energy Corp., San Antonio, Texas. The company uses an enterprise application which connects the ERP system to shop-floor systems providing a compre-



hensive and nearly real-time view on the consumption of the different energy resources (e. g., steam, electricity, and fuel gas). So-called „energy dashboards“ provide persistent, real-time visibility to operators as to how they are running their plants from an energy consumption perspective against model predictions and dynamic targets for all the company’s 15 refineries. By nearly real-time visibility into leakages, idle times of equipment, or benchmarks between different refineries, Valero estimates the annual energy saving potential at USD 4 million to USD 12 million per plant. The resulting improvements in energy management across the company’s 15-site fleet of refineries are projected between USD 60 million and USD 180 million annually [1, p. 28]. This is not only a considerable benefit for the company’s bottom line, it also saves costly resources and reduces emissions of greenhouse gases (GHGs).

- Automation, integration and insight into large amounts of data are key for business applications that help optimize the use of raw materials and energy along the life cycle of consumer products. Life Cycle Assessments (LCAs) are being used to assess the environmental aspects and potential impacts associated with a product, process or service along its entire life cycle, including the procurement of resources, the production, distribution, use and end-of-life phase [2, p. 2]. French consumer products company DANONE has recently teamed up with SAP to implement a highly automated software solution to measure the carbon footprint of 35,000 products (SKUs) on a regular basis. The comprehensive solution enables visibility along the entire value chain regarding resource consumption, namely water, energy and others, and the related carbon emissions.

Beyond the reduction in carbon emissions and the increase in resource efficiency the solution enables the company to differentiate itself from the competition regarding the consumption of resources [8].

Competitiveness – increasing the top line through sustainable innovations

Logistics provider United Parcel Service (UPS) provides an example for increasing eco-efficiency with a positive impact on the company’s operating cost and the environment. Information technology lies at the heart of the company’s software- and hardware-based routing technology called Package Flow Technology (PFT) for the optimization of delivery routes [19]. PFT is shortening delivery routes, minimizing engine idle times and combining multiple deliveries into a single stop. According to UPS’ CFO, Kurt Kuehn, PFT has saved 1,000,000 miles from UPS’ delivery routes since 2003. It has also reduced fuel use by 10,000,000 gallons and carbon emissions by more than 100,000 metric tons [12].

Also, UPS is a good example for a company that has increased its brand reputation by focusing on sustainability. By advertising its resource efficiency UPS uses sustainability as a competitive differentiation factor and claims to „help businesses turn sustainability into a competitive advantage“. The company has demonstrated transparency and leadership in reducing its supply chain emissions as well as its customers’ emissions. It has established strong supply chain reduction goals and uses information technology, an efficient aircraft fleet and innovations like low-carbon alternative fuels and vehicles. Most recently the company has developed a modular software enabling UPS to measure their GHG foot-

print down to the individual contract level, which is now used to consult large customers on shipping activities [6].

Companies such as General Electric, Procter & Gamble (P&G) and DuPont have set aggressive R&D targets for making existing and new products more sustainable. As part of its sustainability strategy Procter & Gamble has set a goal to generate USD 50 billion in cumulative sales from „sustainable innovation products“, i. e. products that have an improved environmental profile, in a five-year period ending in 2012. Cumulative sales of these products between July 2007 and June 2011 are at USD 40 billion. Since July 2002 P&G has cut energy use by 52 %, carbon dioxide emissions by 53 %, waste disposal by 61 %, and water use by 58 % [16]. Now the company extends its strategy to reach into its supply chain network. The goal is to help suppliers either to move forward with their efforts or to get started working towards sustainability.

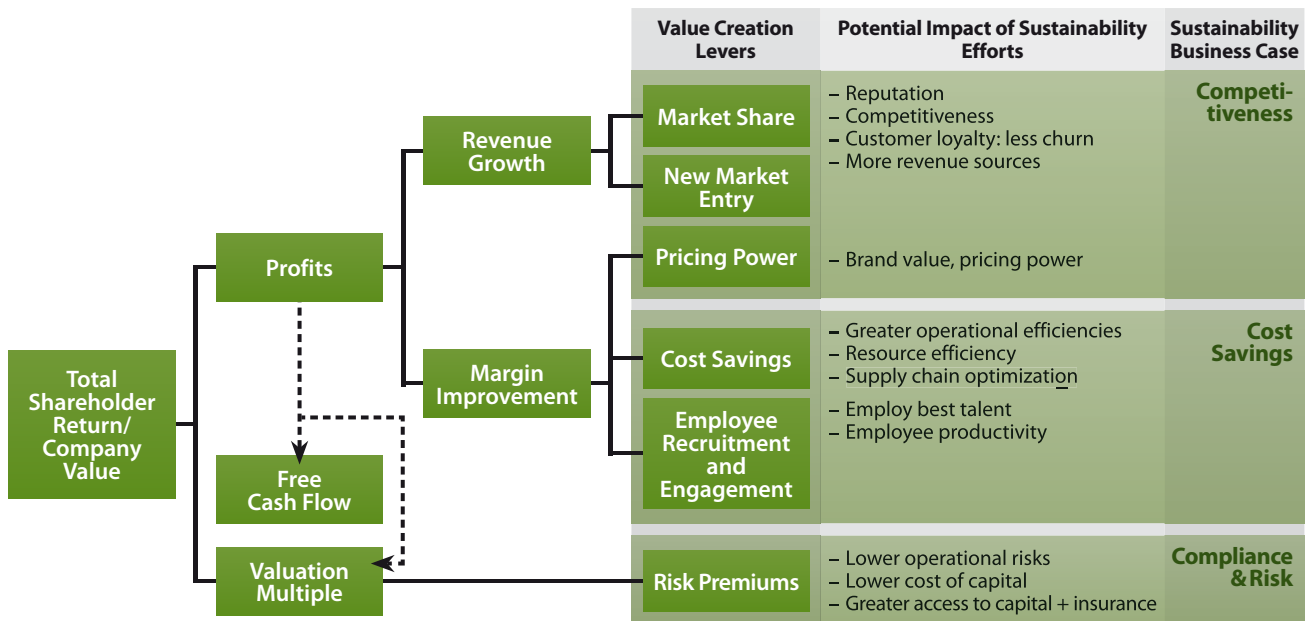
In spring 2010 P&G initiated and rolled out an IT-enabled sustainability scorecard program for its suppliers. The so-called „Supplier Environmental Sustainability Scorecard“ is transparent, easy to implement and requests information on energy, carbon emissions, waste and water. The scorecard uses measurement standards from the World Resources Institute, the World Business Council for Sustainable Development and the Carbon Disclosure Project [9], which are accepted worldwide. Similar to the so-called „Walmart Supplier Sustainability Assessment“ [20], Procter & Gamble uses information technology in interaction and data collection from suppliers.

Compliance – managing risk with standardized processes and automation

Environmental regulations regarding the safety of products and operations continue to increase. For companies this means a serious and sometimes painful exercise to comply with environmental and safety regulations (REACH, RoHS etc.). Yet, there is no alternative apart from compliance to these regulations in order to secure the license to operate and to avoid costly penalties. Furthermore, in addition to regulatory measures in case of non-compliance, there is related financial risk. In 2007 alone there were 231 recalls with a total number of 45 million children’s products in the US, affecting public opinion and customer loyalty and implying claims from consumers and authorities with impacts on the financial performance of the respective companies [11, p. 4].

How does compliance relate to innovation here? In what way does sustainability drive innovation and value? As a result of the sustainability challenges, authorities increase regulatory pressure. In today’s highly automated, interconnected and globally operating business world compliance, however, does almost certainly require changes in business process, standardization and automation, which are provided by business applications. The implementation of the latter will generate a positive return-on-investment, since standardization and automation mostly relate to efficiency gains and cost savings. Canadian chemical company Nova Chemicals, for instance, is cited to have achieved a payback of its Environ-

Fig. 1 | Sustainability impact levers of value creation



Source: [adapted from 3, p. 21]

Lessons Learned

Scarcities drive innovation. In addition to the growing depletion of natural resources, environmental regulations and cap-and-trade mechanisms create artificial scarcities. In both cases businesses will seek innovative ways to increase resource efficiency. Anticipation of scarcities and resource bottlenecks (including scarce raw materials, emissions as well as human talent) and the management of supply chain risks will become key topics for successful companies in a resource and emission restricted economy.

Mastering resource efficiencies is of increasing importance and lies at the heart of Enterprise Resource Planning (ERP). Optimizing enterprise resources and business processes is the classical realm and domain of enterprise software and business applications. This concerns IT-enabled automation (process innovation), optimization of business processes within the company's value chain and increasing resource productivity, as well as product and process innovation with the help of information and communication technology. IT is therefore an enabling technology that can play an important role in transforming a company into an enterprise with a business model that continues to increase its economic value as well as its sustainability performance.

The concrete company examples cited are structured along the value tree and the major aspects of (1) compliance and risk management, (2) cost savings that lead to margin improvement, and (3) measures that improve the competitiveness of the company in the sense of making the company's products and services more appealing to customers, hence leading to increased market share, entry into new markets and overall top-line growth (see figure 1).

The three aspects described also suggest the natural sequence and staging of sustainability efforts within companies. In the initial stage, imminent compliance and risk management aspects (regulatory, operational, reputational) need to be addressed. As in the case of REACH compliance or other regulations, companies not compliant with the regulatory requirements are simply restricted to do business in the market („no data, no business“). In reaching the next stage of maturity, the efforts are particularly targeted at resource efficiency and operational effectiveness, resulting in cost reduction and margin improvement. Entering the final stage, companies begin to consider the strategic advantage and the business opportunity provided by sustainability, realized by building increased brand value and revenue growth with sustainable service and product innovations that address new customer segments and enter new markets.

ment, Health and Safety (EHS) application to manage greenhouse gas emission credits in less than two years [17].

As shown, initiatives for corporate sustainability provide ample opportunity for both top-line and bottom-line improvements. A final example highlights yet another important aspect of corporate sustainability, namely social responsibility. Furthermore, it exemplifies the interrelation of technological and social aspects in successful innovation. In this case, SAP supports a value chain reinforcement program with local microcredit partners and a group of 3,000 women who produce shea nuts in Northern Ghana [18]. The program empowers the women to run and manage their own business entities. Innovative software solutions take online orders placed by large international buyers, and channel them for transmission to the rural women's cooperatives via their group-owned mobile phones. Along with this order information, current market information on shea nut and butter prices will also be sent through their mobile phones, so that they never have to sell their shea products for less than the going market rate. This project is conceptualized as a social business, which means that its main objective is social, and

the moderate profits are re-invested to increase the business and meet the social objectives.

Conclusion

Sustainability is one of the most important challenges humankind is facing today and in the future, as key resources are nearing depletion and the global climate is nearing a tipping point. Its implications outclass the financial crisis in the long term. Given their dominance in the global economy, business organizations play a key role in creating value and enduring prosperity. Likewise, they can play an important role in promoting sustainability by focusing on long-term business success and assessing the impact of their business operations on economic and environmental performance.

The value tree illustrates the economic levers and drivers of company value. It can also be used to describe the impact of sustainability measures and innovations enabled by IT on the economic value of the company. From the perspective of this model, regulatory requirements constitute an external factor to be addressed by companies in their business opera-

tions. To ensure compliance with a growing number of regulations, companies increasingly rely on the help of enterprise software which ensures data transparency as well as auditable business processes. These regulatory-driven aspects are part of the management of risk (regulatory, operational, reputational, financial).

Scarcities (natural or artificial) drive cost consciousness and resource efficiency. Companies react by actively seeking a potential for gains in efficiency and resource productivity. If managed successfully, this drive can lead to improved margins and increased competitiveness for the company's products and services.

As could be seen in the examples provided, some companies recognize the related business opportunity. The focus on resource efficiency can open up company resources to be directed into sustainable development. Embracing sustainability as an element of the corporate business strategy can lead to higher brand value and new revenue growth with sustainable service and product innovations.

Finally, IT does not only provide opportunities for business process improvements, efficiency gains, cost reduction and competitive advantage, it can also help serving a social purpose, support social business and thus exemplify corporate social responsibility.

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