Sustainability - Translation to Action

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Abstract

In Europe and increasingly in the rest of the world the Sustainability debate is moving from understanding towards action. However, the transition from "motherhood" statements to tangible, valid actions is very difficult, and organisations frequently fail to recognise the scope and nature of what is required. Sustainability cannot be addressed merely by incremental changes to current practices. The necessary step changes in behaviour and performance require the generation of new organisational capabilities, and therefore the adoption of new techniques. This paper presents an analysis of the problem, and outlines work from that has addressed some of the individual issues that fall under the Sustainability umbrella.

Introduction

Over the last twenty years the concept of Sustainability has permeated society, industry, as well as national and international governmental organisations. While a very large number of definitions exist, none will be used exclusively here. Instead, it will be noted that Sustainability includes ideas of

- Proportionate use of resources, and in particular controlled and intelligent use of non-renewable resources;
- Respect for and protection of ecosystems and the natural environment;
- Economic viability; and
- Social acceptability and engagement.

The self-evident validity of the concept is, however, difficult to address in practice. Sustainability is difficult to interpret for a number of reasons:

- Sustainability is a social construct, insofar as the finite availability of resource and essentially infinite demand mean that society has to determine which activities will be sustained;
- It is not yet possible to determine the total resource available to deploy to meet human needs, and therefore measures of sustainability are by definition relative rather than absolute [ie it is not possible to say that some activity is absolutely sustainable];
- We cannot yet associate costs unambiguously with the use of "free" environmental goods – for example the environmental media for disposal of industrial wastes;
- The problem is a global one, which is outside the power of any organisation or nation to address alone, and therefore includes a strong political element.

Sustainability is relatively easy to discuss at a global level, so long as one ignores the barriers and impediments presented by history such as nations, existing infrastructures, organisations etc. At a more detailed level – for example that of a company – the argument is more difficult. This is partly because an organisation can

only be sustainable within a sustainable society [which is outside the direct control of the organisation], and partly because the company may be in a business that is by definition unsustainable. The concept of a sustainable oil company is hard to reconcile. This difficulty has led to several attempts at redefinition – some useful and some cynical. Some organisations have started to redefine sustainability to encompass only those elements under direct control – eco-efficiency for example. Others have pushed sustainability into the corporate social responsibility area – recognising that their sustainability is to a great extent driven by societal acceptance. Some have redefined the company to provide a long term sustainability route – for example some oil companies have redefined themselves as energy suppliers rather than an oil companies.

A key problem that organisations face is to understand that Sustainability involves both delivery of current business processes better, and the transition to new processes. It is clear that the sum of the current process industry technologies is unsustainable – the means we currently use to deliver the desired outcomes are too polluting and resource-inefficient. To deliver transport, materials and chemically-based effects we will need substantial improvements. However, the pace of change in the process industries is slow – because of the high capital costs, established infrastructures and the difficulty of developing new, more sustainable technologies that are viable in the market. Thus, we need also to deliver current technologies efficiently. The need for organisations to be "ambidextrous" in this way is key.

These arguments point to the need to embed sustainability in all levels of an organisation, and to consider how to deliver against both the current and long term agendas. Some of the outcomes that are needed to promote sustainability are listed in Table 1. Given the wide range of challenges, it is clear that organisations need to have, or to develop, capabilities to address them. As well as the efficiency, control and reproducibility that characterise the "present" challenges, it is important to consider the wholesale cultural and technical capability changes that characterise the "future" issues.

Table 1 Organisational outcomes required to address sustainability in the short term and long term

Sustainability Issue	The present	The future
Proportionate use of resources	Efficient processing using current technology Efficient products	Step change efficiencies in processes New feedstocks Novel means to deliver effects
Protection of ecosystems and nature	Low pollution processing Accident avoidance	Inherently low risk, low emission processing
Economic viability	Efficient processing Efficient logistics	New business models enabled by new technologies
Social acceptability and engagement.	Corporate social responsibility to manage risk	Inherent corporate social responsibility Behaviours consistent with international and intergenerational equity

The organisational capabilities that are needed to address the problems include those that have traditionally been involved in process operation, as well as a new set. In the last 20-30 years organisations have adapted to meet the agendas of tightening quality requirements, environmental protection and safety demands, as well as volatile (and recently rising) energy costs. The capabilities developed to address these can be characterised by the "quality cycle" shown in Figure 1.

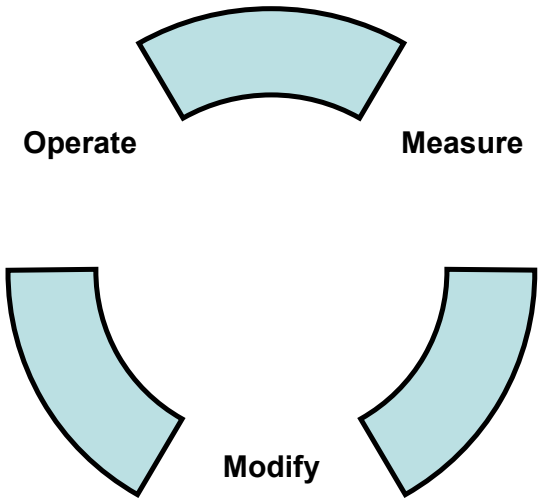

Figure 1 The Quality Circle

Additionally, an innovation agenda for the development of new products and processes has long been in place in many organisations, and many organisations possess relevant skill sets.

The challenges of sustainability could be seen as falling within a combination of the quality cycle and the need for ongoing innovation – and an organisation that has good capabilities in both areas might see itself as well prepared for the task. However, a new set of issues must be addressed, and significant changes are required to current practice. The pervasive nature of sustainability means that traditional "functional" organisation structures are poorly adapted to the need. Co-ordination and communication become more important, both internally and outside the organisation. New technical skills need to be developed side-by-side with commercial and communications capabilities. As well as functional change, organisational culture may need to adapt.

This paper will illustrate some of the challenges and possible ways forward through a series of short case studies on techniques that have potential to help. This does not represent a complete "toolkit", but does illustrate the ways in which current thinking could be modified.

A new portfolio of skills

The following sections present examples of analysis tools that address some of the shortcomings of current practice, and could be deployed to improve an organisation's capability to deal with the Sustainability issue. These do not represent a complete

set, but should rather be seen as illustrative of the way in which one might explore the new degrees of freedom introduced by the problem of sustainability.

Project Cost Appraisal

Traditional project evaluation techniques have often been based on discounted cash flow techniques and net present value calculations.

$$NPV = \sum_{\substack{i=0\ldots project \\ life}} \frac{cashflow}{\left(1+IRR^{i}\right)} \qquad (1)$$

Usually, a single internal rate of return value is used, with the value based on the company's financial strategy. The value is based on a combination of a desired rate of return and a risk premium. This approach has been criticised because is fails to acknowledge either that different aspects of an investment are subject to different levels of risk, or that different aspects of the cost profile of an investment may be subject to different rates of inflation. For example, [1] studied end of life closure costs, and introduced differential rates for the main part of the investment and the remediation on closure.

This approach has been extended to account for the parts of an investment cost that are either likely to be subject to greater than average inflation (for example energy costs) or have a greater risk associated with them (for example disposal costs for hazardous waste). The NPV can then be expressed as

$$NPV = \sum_{\substack{j \\ categories}} \sum_{\substack{i=0\ldots project \\ life}} \frac{cashflow}{\left(1+IRR_{j}^{i}\right)}$$

where the j categories refer to parts of the investment that have different risk or likely inflation characteristics.

Technology Investment Decisions

A critical decision for a company is to decide *when* to introduce a step change technology. Too early and the technology may prove ineffective or uneconomic, while excessive delay will reduce the benefit. Where the technology is critical to profitability, such decisions can amount to a gamble on the future of the company. Such decisions are usually made against a background of uncertainty – for example in raw material and energy costs, product value, technology performance etc.

Real options analysis has been tested as a means to support the timing of investment decisions [2]. The basis is to consider time-dependent variables not as deterministic, but to consider their behaviour in terms of their mean and variance and the assumption of "Brownian Motion" of the variables. By characterising the behaviour of, for example, energy prices in terms of these variable, it is possible to replicate the variability of energy costs and represent them in an investment decision.

The options framework also supports the valuation of an investment to keep an option open. For example, consider possible fuel cell technologies. There are multiple competing technologies, where each is subject to uncertainty in its final cost and efficiency. Cost estimates can increasingly be found in the literature [3], and

forecasts have been made of future costs [4]. By considering both the volatility of the energy price and the expected decline in energy cost from fuel cells it is possible to estimate the value of delaying investment until further information is available. The greater the volatility in the costs, the greater the value of being able to delay.

Stakeholder interests

Social Sustainability requires that a company engages appropriately with its "stakeholders". Note that in this context a stakeholder is defined as anybody who believes they have a legitimate interest in the company's activities, and includes owners, financiers, employees, neighbours as well as environmental pressure groups. While in many places there is resistance to such a broad spectrum of interests being called stakeholders, it is clear that all of these groups have the potential to impact on the company. For example, many companies from the process sector have suffered losses as a result of campaigns by environmental pressure groups.

It has been found useful to use the product lifecycle as a framework to identify the key stakeholders [5].

For example, consider the PVC supply chain shown in Figure 2.

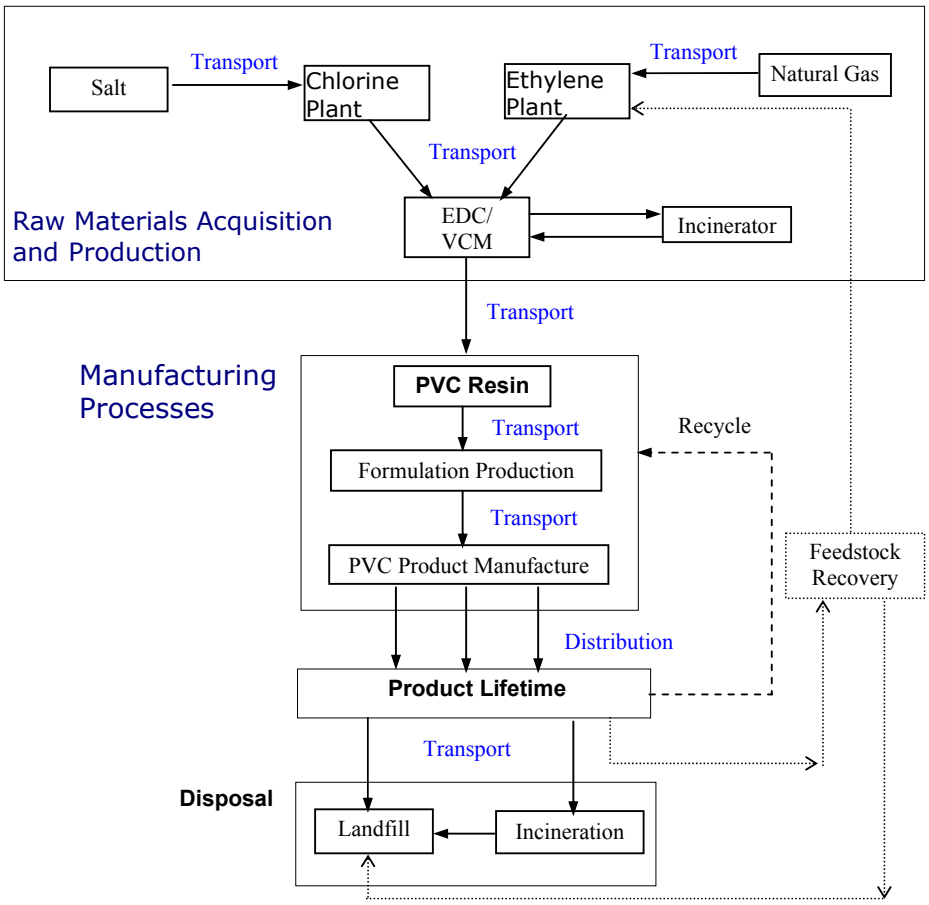

Figure 2 The PVC life cycle [5]

For each stage it is possible to identify the relevant stakeholders and identify their likely concerns through a series of "what if" questions related to initiating event. Through ranking the likely concerns in terms of probability and serious it is possible to rank the possible adverse (or indeed positive) stakeholder interactions. An excerpt of a typical analysis is shown in Figure 3.

This technique is an effective bridge between the technical world and that driven by human perceptions – politics, pressure groups and the media for example. Only by learning to bridge the gap effectively can organisations manage their interactions with society effectively, and thereby retain the confidence of society.

SCENARIO / STAKEHOLDER		CONSEQUENCE	LIKELIHOOD	IMPACT	
				Business	Image
General Public (P)					
Public demand for particular PVC products decrease	P1	There is a wide variety of PVC retail and industrial products, so the effect is selective. As a raw material supplier, the impact will be diffused.	Low	Low	Low
PVC related companies labelled as 'unethical investments'	P2	Deter potential investors and shareholders.	Medium	Low	Medium
Environmental Pressure Groups (G)					
Campaign for sustainable resource usage (natural gas consumption)	G1	Reduction of the availability of ethylene gas and the cost of raw materials increase, as PVC production is heavily dependent on natural gas. Selection of supplier will occur.	Medium	High	Low
Campaign against the chlorine industry	G2	As PVC resin production is very dependent upon the chlorine Industry, raw material costs will be affected.	Medium	High	Medium
Campaign against PVC resin production	G3	Company's name displayed on website/in pressure groups' publications.	High	Low	Medium
And other cases…					
Residents (R)					
Significant increase of traffic in locality due to construction/.decommissioning work	R1	A temporary situation that is usually tolerated by the community.	High	-	Low
Increase of road accidents in locality	R2	Community might blame presence of plant but they have no direct evidence.	High	-	Low
Significant increase of traffic in and out of plant (e.g. material transportation)	R3	Scrutiny of material inventory by residents. Might perceive it as a health and safety risk, resulting in individual approaches to the company.	Medium	-	Medium
More roads built in locality	R4	Impairment of landscape, resulting in passive disapproval.	High	-	Low

Figure 3 Excerpt from stakeholder scenario analysis [5]

Staff engagement

Given the all-encompassing nature of Sustainability it is clearly important that all staff are able to act in a way that supports the aim. However, it is difficult enough for organisations to align individuals' actions with the companies' basis operational requirements. The problem is less at the process operator level than the middle management and technical staff who are at the front line of design and process operational decisions.

To assess the quality of understanding of the concept of sustainable development a survey was carried out that investigated the level of understanding of employees of a major European Oil Company [6]. Staff from both EHS and engineering functions were assessed for their ability to define Sustainable Development, as well as the extent to which they felt it impacted on their job. The results indicated that understanding was partial – nobody came up with a definition that included all of the key concepts, and on average they could manage about ¼ of the key elements.

It might be argued that the staff – who were mostly junior and middle level technologists and technical managers – would only see the operational aspects of sustainability, and therefore aspects such as intergenerational equity were irrelevant. However, the results still indicate a distortion of the concept that might induce complacency.

It is clear that the establishment of effective training would be needed to establish understanding of the concept and therefore to enable decisions at least by the staff interviewed to incorporate sustainability factors.

Measurement of sustainability

It is widely asserted that "to manage you have to measure" – and this philosophy as given rise to a wide range of metrics for sustainability. While such metrics have a place, it is critical that they are appropriately used, and do not generate a false sense of security. In general it is easier to develop metrics for the technical aspects of sustainability (ie economics and eco-efficiency) than the social aspects. It is also easier to deal with the current operations aspects than innovation. In selecting metrics it is essential to be clear about their purpose and limitations.

A key problem with metrics is that they are relative rather than absolute. We cannot say that a process is or is not absolutely sustainable. Sustainability is a matter of meeting human needs, and subjective judgements about the relative importance of needs are inevitably present.

Visioning

A useful tool in developing an understanding of the meaning of sustainability to an organisation is to consider how the organisation meets its short and long term needs. To do this, a structure analogous to Maslow's Hierarchy of

Needs is useful, based on the work of Winsemius [7]. This is illustrated in Figure 4.

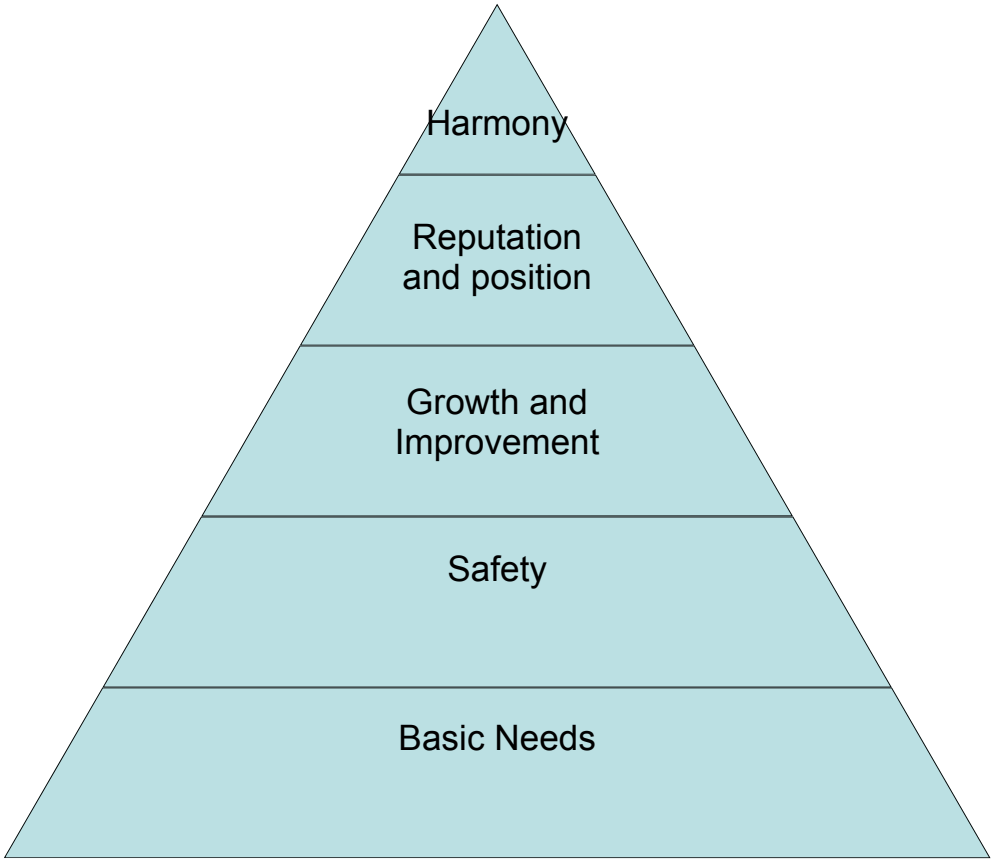

Figure 4 Sustainability Heirarchy for a company

Basic needs include Employees, Products, Sales, Equipment and a License to operate– the things necessary for day to day operation. The safety level provides the mean to continue these – cash flow, secure IP rights and compliance with regulations for example. Growth and improvement require access to capital and the skills to develop the attractiveness of the product portfolio. Reputation and position involve broader societal recognition of the importance of the company's goods and services, as well as strategies for innovation capabilities for step change improvements. The interpretation of these levels of the hierarchy helps to clarify the short, medium and long term issue that face an organisation.

Conclusions

To understand fully the implications of sustainability is a substantial task that needs to permeate all aspects of a company's activities. Inevitably there will be a clash between the short-term interests of maximising the return from current investments and the need for step changes in behaviours in the long term. While none of the

techniques identified here is necessarily applicable, together they illustrate some of the areas that require new thought.

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