Defining Quality and Sustainability
– Looking for Synergies

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Abstract

Introduction: Both quality and sustainability are frequently used and positively loaded words. On the overall level most people agree that we should both have quality and sustainability in the processes we are working with. Logically there should be synergies in improving quality and sustainability but there could also be conflicts. When assessing how well our processes are performing, it becomes more complicated to find a consensus since there are many and partly conflicting views and definitions on what quality and sustainability mean. What we cannot measure, we cannot improve and what we cannot define we cannot measure.

Purpose: This paper reviews definitions for quality, sustainability and sustainable development with the purpose of highlighting synergies. Definitions and measurement principles combing quality and sustainability are proposed.

Methodology/Approach: Quality and sustainability are discussed and some working definitions are proposed. Garvin’s (1984) five approaches to define quality are applied on the working definitions for quality and sustainability. The approaches are reviewed and exemplified with some products to test the feasibility of the approach. The development of quality and sustainability is studied based on a chosen change process. The resulting categorisation of quality, sustainability, quality development, sustainability development and sustainability development are reviewed for identifying synergies.

Findings: Findings indicate that there are more of synergies than differences and that it is possible to define an operational definition combining quality and sustainability that can be used for assessing and improving performance.

Implications: The results provide help for an operationalization of combined quality and sustainability performance.

Originality/Value of paper: The paper proposes a practical interpretation of how to work with quality and sustainability development.

Keywords: Defining quality. Defining sustainability. Sustainable Development. Stakeholder. System

Paper type: Research paper
Introduction

Quality and sustainability are both popular and positively loaded words. There is therefore the obvious risk that they are used inappropriately and that their meaning is diluted. Robert Engelman, president of the Worldwatch Institute says that: “We live today in an age of sustainababble, a cacophonous profusion of uses of the word sustainability to mean anything from environmentally better to cool” (Engelman, 2013). Similarly quality is used without too much precision and a quality product could mean many things. In most organisations change for improved quality and improved sustainability is important in the search for sustainable growth. Sustainability and sustainable development are spoken of quite often without much distinction between the two (Rao, 2000). When sustainability or sustainable development are defined the most common definition is that of the Brundtland commissions stating that: Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987:43). This lends itself to many interpretations and might not therefore be specific enough to serve as guideline in practical work for improved sustainability. Quality is often defined seen from a customer perspective, but it could also be seen from the producer perspective (Garvin, 1984). Garvin presents the five approaches of product quality as the transcendent, the product-based, the user based, the manufacturing-based and the value-based definition. He argues that often these different perspectives cause confusion when using the world quality generally. An example of differences is when the production department sees quality as depending on the quality of material used and the level of workmanship (Product quality) and further that manufacturing is done according to specifications (Manufacturing quality) where as marketing listens to customers appreciation of performance (user based quality) and what they get for the money (value based quality).

When quality in schools and universities is discussed the underlying meaning is often a producer perspective defined as following prescriptions and having the right competency. The Swedish school law from 2010 covers 138 pages and mentions quality 20 times. However, nowhere in the document is there a clear definition of quality. References to controlling documents are given, which leads to the conclusion that there is little or no customer focus and that quality is defined as following rules and regulations and by having the right competency. A further look at the web site of the Swedish School Inspection web site gives no answer on what quality is. The Swedish school debate is very active and one of the big discussions for the forthcoming elections in 2014. Still, quality, the main issue discussed seems not to have been clearly defined. It could be that the comments from Garvin (1984) on misunderstandings because of unclear definitions still are valid.

It seems that quality and sustainability are used and misused without further specification to mean different things. Without clear and meaningful definitions change work for higher levels of quality and sustainability becomes difficult. Joseph Juran advocates the creation of a company internal glossary defining important expressions. An interpretation of this is that organisations need to define key expressions used in order to create a common understanding in for example how quality and sustainability are viewed. Isaksson and Hallencreutz (2008) describe five steps for making change happen. These steps are understanding, defining, measuring, communicating and leading change. This can be exemplified with global warming, an important issue for sustainability. Svante Arrhenius was the first to understand and describe how CO$_2$ in the atmosphere could relate to Earth’s temperature in the end of the 19th century. Arrhenius defined this as the greenhouse effect where higher CO$_2$ in the atmosphere leads to higher temperatures on Earth. This can be measured by the level of carbon dioxide in the atmosphere and with the average global temperature. This explains the cause effect relationship. Communication of these results has been done using data from measurements by various instances including persons like Al Gore and scientists from the Intergovernmental Panel on Climate Change.
Leading the change to reduced emissions is the work for political and company leaders. This could be related to the eight steps of leading change where the first one is creating a sense of urgency (Kotter, 1996). This step could be seen to relate to communicating the change needed to create the required urgency.

Quality and sustainability would need to be understood collectively in the organisation or system concerned, then defined and quantified with agreed indicators to enable measuring of the performance. With results from measurements that are compared with goals it will be possible to communicate needs for change as an input for managerial decisions to lead change.

This paper reviews definitions for quality, sustainability, quality development and sustainable development with the purpose of highlighting synergies. Definitions and measurement principles combing quality and sustainability are proposed.

Methodology

Quality and sustainability are discussed and some working definitions are proposed. Garvin’s (1984) five approaches to define quality are applied on the working definitions for quality and sustainability. The approaches are reviewed and exemplified with some products to test the feasibility of the approach. The development of quality and sustainability is studied based on a chosen change process. The resulting categorisation of quality, sustainability, quality development, sustainability development and sustainability development are reviewed for identifying synergies.

Overall view of quality and sustainability – working definitions

Both quality and sustainability imply some level of state, possibly with quality been seen more as a variable such as good quality and bad quality. Sustainability is in its original sense more definite. It is hard to envision good sustainability and bad sustainability. We could possibly use the level of sustainability and the level of quality as parameters. The current level of quality and level of sustainability can be assessed when there are targets. When performance is not on target, development is needed. Quality development is rather straightforward as an expression. The expression sustainability development is normally not used. Logically this expression should mean improvement work to improve the level of sustainability. Like with quality development, sustainability development does not have to mean that the rate of improvement is sufficient, or in other words that there is sustainable development. Engelman (2013) notes on the word sustainable that: “The original adjective—meaning capable of being maintained in existence without interruption or diminution” dates from Roman times. This assumes that there is a system that is sustainable and which can be further sustained. Since the current global system is not sustainable we would need a change to a sustainable level of performance. Sustainable development on any dimension of system performance, e.g. quality or sustainability, could be defined as the rate of development needed to reach a sustainable system level, before the system collapses (Isaksson and Steimle, 2009). This means that the rate of improvement would define if we only have development or sustainable development. We could use the same approach for quality. Sustainable quality development would be improvement at the rate that assures achieving a required level within a deadline, see Figure 1.
Figure 1. Conceptual view of level of quality, level of sustainability and sustainable development.

We could thus define state of performance as: Level of quality or level of sustainability compared with an assessed target for the sustainable system. Quality and sustainability development could be seen as the rate of improvement. Sustainable quality and sustainable sustainability development would be defined as the minimum rate of improvement to the level of the sustainable system within a deadline. The next question is what should be measured which depends on how we understand, define and measure quality and sustainability.

**Garvin’s aspects compared to quality and sustainability**

Garvin (1984) makes a point of that several aspects are needed simultaneously to appreciate quality. The five approaches are tested for feasibility on three products. Here, product is defined as any combination of goods and services including experience based services. These example products have been chosen to describe different mixes of goods and services. The three products looked into are: A motorbike (goods), an educational program (service) and a river cruise (service and experience quality), see Table I and II. In order to apply the approaches to sustainability the main stakeholders have been identified as producer (business), user (customer), nature (environment) and people (social part). This reflects the Tripe Bottom Line (TBL) that is often used to describe company sustainability in the economic, environmental and social dimensions (Elkington, 1999). The TBL is also expressed as Profit, Planet and People. The customer or user could be seen to belong to the economic dimension. The user is the individual buying the product where as people make up the population subjected to value and harm in the system studied.
Table I Review of the product motorbike using Garvin’s five approaches (Garvin, 1984)

<table>
<thead>
<tr>
<th>Approach (interpretation from Garvin)</th>
<th>Quality (producer/user)</th>
<th>Sustainability (nature/people)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcendent - in the eyes of the beholder.</td>
<td>Delivering an experience; The view of a Harley Davidson fan – piece of art</td>
<td>The view of personal freedom; The direct experience of the elements</td>
<td>This approach could be seen as user based. Possibly not relevant for nature as stakeholder since this cannot be assessed.</td>
</tr>
<tr>
<td>Product – quantity of some desired ingredients or attributes</td>
<td>Product specification; Quality of materials; Level of engineering competence; Performance in speed, horse powers and sound</td>
<td>Environmental and safety specifications; Level of fuel consumption; Material consumption Recyclability;</td>
<td>Good product quality costs more since quality is defined using cost drivers. Often described using different product segments.</td>
</tr>
<tr>
<td>User – Quality consists of the capacity to satisfy wants; Fitness for use</td>
<td>Perceived quality and status; Utility; Level of safety</td>
<td>Effects on nature; Noise</td>
<td>Garvin takes up the difference between needs and wants</td>
</tr>
<tr>
<td>Production (manufacturing) - conformance to requirements</td>
<td>Deviations from specifications</td>
<td>Deviations from specifications</td>
<td>Better quality costs less, since there is less rework and scrap.</td>
</tr>
<tr>
<td>Value – user value in relation to price paid</td>
<td>Customer wants and needs compared to price</td>
<td>Economic gain compared to main harm like CO₂ emissions and occupational safety issues in supply chain</td>
<td>Main harm could be described using parameters from the nine planetary boundaries (Rockström &amp; al., 2009)</td>
</tr>
</tbody>
</table>
Table II Review of the product university program and a river cruise using Garvin’s five approaches (Garvin, 1984).

<table>
<thead>
<tr>
<th>Approach</th>
<th>Educational program</th>
<th>River cruise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcendent - in the eyes of the beholder</td>
<td>Quality (producer/user)</td>
<td>Sustainability (nature/people)</td>
</tr>
<tr>
<td></td>
<td>The feeling of this being the best ever program</td>
<td>Experienced as top sustainability program</td>
</tr>
<tr>
<td>Product – quantity of some desired ingredients or attributes</td>
<td>Course syllabus; Highly merited educator competence (research and pedagogies); Hours of education in program</td>
<td>Content of sustainability in program syllabus; Educator competence in sustainability; Campus sustainability</td>
</tr>
<tr>
<td>User – Quality consists of the capacity to satisfy wants; Fitness for use</td>
<td>Perceived quality and status; Utility prospects of employability; Stress level;</td>
<td>Level of competence within work for increased sustainability</td>
</tr>
<tr>
<td>Production (manufacturing) - conformance to requirements</td>
<td>Deviations from specifications (course syllabus)</td>
<td>Deviations from specifications (course syllabus)</td>
</tr>
<tr>
<td>Value – user value in relation to price paid</td>
<td>Employability and things learnt compared to time and money used</td>
<td>Level of sustainability competence to main harm like CO₂-emissions and occupational safety issues in supply chain</td>
</tr>
</tbody>
</table>

The first review of Garvin’s quality aspects for the three products chosen indicates that the approaches can be used for any type of product, not only goods. In most cases the same approach seems to be valid for sustainability. When viewing nature as a stakeholder it is however not possible to assess transcendent quality since this would mean defining it seen from nature’s perspective. Production quality as conformance to requirements comes out as same for all examples. This corresponds to the part of quality dealing with “doing things right”. The product specification or design is part of the product quality. The product design (including all service components) is assessed by the different stakeholders and a decision is made if it is “the right thing” - if there is quality and sustainability. Here, there is a risk of a conflict of interest where business would be interested in a high sales value and a high sustainability image (transcendent quality) to a low cost. The customer is interested in high product value and perceived value for a low price. Society or people are interested in an economic contribution for little harm while specifying a minimum value for product quality, particularly with focus on safety. Nature is
mostly subjected to harm where the issue is defining the limits or the minimum level to be respected. Organizations could be viewed as systems that are sub-systems of larger ones and in the end part of the global system. In the global system a number of resources are limited as described by Rockström et al. (2009). This indicates that sub-system limits should be derived from global limits if we are aiming at a sustainable level of performance. Isaksson and Garvare (2003) identify the two main global stakeholders as humanity and nature. This would mean that People and Planet are the two things to focus on, which would indicate that Profit is only a means to an end, not an end itself (Isaksson et al. 2013). The values based sustainability on a global level could be expressed as People/Planet. The Human Development Index (HDI, 2013) could be used to describe People utility and the Ecological Footprint (EF, 2013) to describe harm done to Planet, see Figure 2.

Figure 2. HDI and the Ecological Footprint for countries compared (HDI and EF, 2013).

For both HDI and EF it is possible to define limits on the global and then on the national level. The EF needs, with projected global population growth, to be lower than 2ha/person to correspond with the global biocapacity. Theoretically each country could then set goals for development for different businesses where the key figure would be Gross National Income or Gross National Product per EF. We still need Profit, but generating this could be seen as a support process of producing goods and services (Isaksson and Garvare, 2003). The Eco Efficiency defined as sales value per impact (WBCSD, 2000) proposes a ratio, which could be seen as Profit/Planet. The challenge is in the translation from sales value to utility. The Global Reporting Guidelines (GRI) define economic sustainability as the sales value and how it is split (GRI, 2006). The problem here is that sales value is basically considered identical to user value, which might not be the case. A monopoly company can increase its price and let customers pay for the costs of poor quality and costs of poor sustainability (Isaksson, 2005). A company that takes it social responsibility should make best use of resources, which could be interpreted as providing the best quality and sustainability per resources used. Quality and sustainability here could be seen as delivering the right thing (Product Quality and Product Sustainability) in the right way (Production Quality). Designing the product performance right
for quality and sustainability presents a challenge. How should the user value be assessed? This value could be divided in needs and wants where needs are something more objective and wants are the personal preferences. I might want to drive my motorbike on the beach, but from a collective point of view this is not a justified need and therefore it is forbidden. Utility could therefore theoretically be split into needs defined using for example the Maslow hierarchy of needs in connection with global resource limits and in wants. This would indicate that even if Profit is a legitimate focus for companies, there would be limits set by planet harm. Important needs as food and housing could be allocated some quotas where as satisfying wants would either be more expensive and based on a market price or rationed. The indicator of sales value to EF or to carbon footprint could be translated to user utility per EF and carbon footprint. If all remaining carbon that can be safely emitted is regarded as a scarce resource then it might be better used in maximising people needs than in maximising wants and profits. The People/Planet indicator could be split into People Needs/Planet and People Wants/Planet. The Planet indicators could be based on the nine planetary boundaries. For each system studied the most important harm could be chosen to start with. People needs could also be compared to People harm or comparing user value to social consequences. In Table III the earlier products are reviewed with proposed indicators for Needs and wants/Planet and Needs/People harm.

Table III. Reviewing the value based approach for products.

<table>
<thead>
<tr>
<th>Product</th>
<th>Needs/Planet</th>
<th>Wants/Planet</th>
<th>Needs/People harm</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorbike</td>
<td>Transportation in carrying load times distance (kg*km)/energy consumption (kWh)</td>
<td>Experience/kWh</td>
<td>Transportation/ Price of transport</td>
<td>Pleasure driving could be seen as self actualisation which would score low as a need</td>
</tr>
<tr>
<td>University program</td>
<td>Employability with quality and sustainability competence/ EF</td>
<td>Attractive education/EF</td>
<td>Employability/ time and money used</td>
<td>Education need defined based on global needs</td>
</tr>
<tr>
<td>River cruise</td>
<td>Learning about nature/kWh, pollution and EF</td>
<td>Experience/kW, pollution and EF</td>
<td>Learning/ disturbance</td>
<td>Learning would be with focus on improving the level of sustainability</td>
</tr>
</tbody>
</table>

The first brief test indicates that it could be feasibly to use a value based approach expressed as people needs per planet harm and as people wants per planet harm as a performance indicators on the organizational process level. In the context of Social Responsibility it should be of interest for organizations to be able to assess how they are performing in order to be able to assess and justify the use of scarce resources. As a starting point the Ecological Footprint (EF) could be used as Planet harm indicator and additionally possible the carbon footprint, which describes one of the planetary limits that we are already breaching. Until indicators for wants and needs can be expressed, a starting point could be using sales values as the enumerator. A first check could be done using sales value per EF and per carbon footprint. Current world average for sales value per carbon footprint can be calculated based on world GNP per world carbon emissions. Values from 2011 result in 2500 US$/ton of CO2. With requirements on substantial reductions in emissions and with further expected growth of the economy the target for 2050
could be as high as 100 000 US$/ton of CO₂ (Isaksson et al. 2013). Using these values we could use Figure 1 where performance would be US$/ton of CO₂ with a target of 100 000 US$/ton of CO₂. This enables us to calculate the level and speed of change needed per year to achieve the target. This would be, if seen as linear, an increase of about 2500 US$/t CO₂ every year during 40 years. Using the proposed definitions it would then be possible to assess if the development is sustainable. Here, different strategies could be used where focus could be in increasing the sales value, the need satisfaction or reducing the carbon footprint or doing all these things.

**Quality and sustainability development**

In simple terms the value indicator could be expressed as value/harm (Isaksson & al. 2010). In its simplest form this would be People/Planet. However to create the people value we need Profit. Value ratios of interest are Profit/Planet, People/Planet and Profit/People. Global limits are set by Planet and People requirements. From the perspective of simplification and operationalization we should identify the main value and main harm for the system studied. In Table IV the previously discussed products are viewed using the earlier discussed change process.

Table IV. Visualised change process for three chosen products. Table based on (Isaksson and Hallencreutz, 2008)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Motorbike</th>
<th>University program</th>
<th>River cruise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand</td>
<td>Agreement on that sustainability is a concern</td>
<td>Clarifying the university mission more clearly as support for society</td>
<td>Agreement on that sustainability is a concern</td>
</tr>
<tr>
<td>Define</td>
<td>Defining main value (sales) and main harm of product and production. E.g. start with EF and carbon emissions during product life cycle</td>
<td>Value as program contribution to individuals and society (throughput) and sales value compared to main harm, which could be seen as time and money used.</td>
<td>Defining the experience and learning value in addition to sales value. Harm as EF.</td>
</tr>
<tr>
<td>Measure (Y and X)</td>
<td>Sales value compared to EF and carbon footprint</td>
<td>Employability, salary and sustainable change ability compared to time and money used</td>
<td>Sales value compared to EF</td>
</tr>
<tr>
<td>Communicate</td>
<td>Communicate internally and externally</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td>Set policy, vision, goals based on planetary and system limits and requirements, strategy and follow up clearly related to chosen measures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The change process in Table IV is an example of quality and sustainability development. Depending on the rate of improvement, this development could possibly qualify as sustainable, see Figure 1. For the development process we could use improvement concepts such as Six Sigma, Total Quality Management or Lean Management. These concepts would hardly need any major modification to be used for sustainability improvement. The main difference would be going from a customer focus to a stakeholder focus. In some cases the customer definition already includes most of the stakeholders. Bergman & Klefsjö (2010) define the customer as the one we create value for and include in this practically all stakeholders such as employees and forthcoming generations. A stakeholder who is excluded is the owner/shareholder who is
not considered customer. This supports the conclusions of seeing People and Planet as the main stakeholders. However, in this paper Profit representing shareholders, employees and customers is seen as a secondary stakeholder.

**Conclusion and discussion**

In order to be clear organisations should be clear on how they define quality and sustainability. A working definition could be to speak about the level of quality and level of sustainability. Provided there is a target for the system studied this enables a measurement of the level of quality and sustainability. System targets for sustainability could be derived from global targets for Planet and People, using indicators such as the Ecological Footprint (EF) and the Human Development Index (HDI). Planet indicators as well as People indicators can be further elaborated. The nine planetary conditions provide a further elaboration from the EF (Rockström & al. 2009). For elaborating the People limits it could be possible to use indicators based on the Millenium Development Goals that among other things describe poverty, health and gender issues (MDG, 2013). Global limits and goals could be broken down to the national level and further to an organizational level. The value based approach of Garvin (1984) could be used to describe performance output. This would at the global level result in an indicator of HDI/EF with a minimum limit for HDI and a maximum limit for EF. Value indicator concerning most businesses would be GNP/carbon footprint and GNP/EF. For the GNP/carbon footprint the target level to be achieved until 2050 is estimated to 100 000 USD/ton of CO₂.

The five quality approaches of Garvin (1984) seem to be relevant for sustainability when dealt with as the level of sustainability. There are obvious similarities for level of quality and level of sustainability. Out of the five approaches there seems to be a clear need of at least four of the approaches, these being the product, production, user and value based approaches. Product quality and sustainability is seen as the specification given. This should be based on system quality and sustainability needs. The production quality is seen as how well production follows quality and sustainability design. At the level of People and Planet there are minimum and maximum values for accepted quality and sustainability. Provided these limits are respected optimisation could then be done using the value based approach using indicators such as customer utility/price and customer utility/EF.

In most cases a product specification relating to system requirements would show that the current production cannot achieve these goals, which means that current level of quality and level of sustainability are not acceptable. This means that quality and sustainability development are needed. Here, sustainable quality development and sustainable sustainability development are defined as change, which results in a level of sustainability within a deadline, see Figure 1.

Results from Table IV seem to indicate that for many products work with both quality and sustainability might still be at the level of trying to understand what this means. Taking university programs in Sweden as an example, it still seems that quality and sustainability have not bee defined seen from a user perspective. Educational authorities do, so far not monitor sustainability and quality monitoring is focusing on product and production quality. Also, the product quality specifications are not in any larger extent based on end customer needs, when seeing employers as end customers. This might go back to the university mission where there might not be a common understanding. It is not clear to what extent employability is a goal and there seem to be no requirements on that this should be measured.
Working definitions for level of quality and level of sustainability are needed to speed up quality and sustainability development. In this work quality methodologies should provide good support for sustainability development (Isaksson, 2006).

References


Isaksson, R. (2005), Economic sustainability and the Cost of Poor Quality, Corporate Social Responsibility & Environmental Management, Vo. 12, pp 197-205.


