Finding Balanced Synergies- Putting Resilient Sustainability into Business and Technical Strategy

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Abstract

Whilst some pioneer businesses have integrated sustainability into their strategic decision-making, this can be a difficult task. Our recent review indicates a blend of both sustainability and resilience is needed, to ensure the reliable synergy of reduced impacts and improved performance which make up sustainable business. This is supported by recent evidence that organisations which do implement such Resilient Sustainability flourish compared to their peers, by benefiting from better risk awareness and avoidance, reduced costs, maintained access to investment, flexible solutions and improved ability to exploit opportunities. However not much detailed help is available for less well-resourced firms on how to implement such an integration and access those benefits.

The paper reports on the development and testing of a new generic flexible approach to decision-support which aims to integrate sustainability and resilience into strategic processes. It is based on techniques from complex systems engineering and influenced by best business practice such as Porter and Kramer’s Creating Shared Value. This allows decision-makers and their teams to approach commercial and technology strategy formation in a new structured way, to identify gaps in their knowledge and create more resilient options which better balance people, planet and profit.

The research uses case studies to test the approach, within Ford Motor Company and other organisational strategy contexts. The paper summarises the findings to date, including user feedback and evidence for how the approach can deliver increased capability for managing risks and uncertainties and thus improve an organisation’s strategic performance.
1.0 Introduction

Sustainability is increasingly a strategic issue for companies (Haanaes et al., 2012) and those which are more sustainable perform better than competitors (Eccles et al., 2012). They also need resilient strategies to maintain this performance in turbulent business conditions (Hamel and Välikangas, 2003, Bhamra et al., 2011, Taleb, 2008). Blending both qualities when making decisions is difficult yet guidance for how to do this- or even half of the task- has been almost non-existent (Bocken et al., 2013, Winnard et al., 2014). Even where executives acknowledge the strategic importance of sustainability issues for their organisations, many are not yet addressing these (Kiron et al., 2013).

Companies also cannot afford to develop every feasible single technology, business model or product option and must choose between alternatives, often at an early stage of their strategy. Therefore a new approach is needed to make the integration of sustainability and resilience into these choices more consistent and easier (Winnard et al., 2014).

1.1 Developing the new decision-support process

The first step was to define sustainability and resilience. It is possible to define sustainability for businesses, based on reducing their negative and improving their positive social, environmental and economic impacts and prioritising those actions which restore various forms of capital (ibid.). Definitions for strategic business resilience vary; possibly because it appears to consist of three main elements. Combining these gives a definition covering the capacity to continue functioning when suffering a disruption of some kind; further capacity to recover from disruption, and adaptive capacity for developing new abilities and resources, preferably in anticipation of problems (ibid.). The synergy between resilience and sustainability is not much explored but is best expressed by Walker et al. (2002) who suggests resilience should be developed in order to deliver sustainability reliably.

1.2 How this new approach benefits companies

The new blended approach was named SuReSDS™ (for Sustainable Resilient Strategic Decision-Support). In every-day business terms its purpose is to facilitate companies in managing forms of strategic and other risk better, which arise as a result of unknowns. This can be shown in the form of a “Rumsfeld” grid as in Figure 1 describing different kinds of uncertainty and risk, named for Rumsfeld’s famous speech (Pullum, 2003, Steyn, 2003).
“Unknown Knowns” represents data which may be available to other organisations but not your own, for example if you are not using sustainability expertise to inform corporate strategy. “Known Unknowns” indicates chaotic random elements of the business context about which there is some information, but low certainty; for example the size and timing of commodity price fluctuations. By expanding the organisation’s capability to manage these two areas, its resilience to disruptions is improved; its sustainability risks are reduced, opportunities exploited better, and surprises have less of an impact on business performance. Although little or no data exists about events in the “Unknown Unknowns” area, the capability to handle these is also improved. The organisation becomes more capable in the other areas; therefore it becomes more resilient to the effects of some types of uncertainty and risk which also occur in this fourth category whether or not they can be anticipated.

1.3 SuReSDS™ process flow

Developed during research hosted by a manufacturing company (Ford Motor Company Ltd), the approach blends the sustainable business ethos of Creating Shared Value (Porter and Kramer, 2011) with strategy creation and comparison techniques from Transition Engineering (Krumdieck, 2013). In addition system-functionality techniques adopted from Robustness Design engineering (FMC, 2011) look rigorously at how each choice improves both sustainability and resilience. The ultimate aim is to identify the most appropriate strategy option(s) for users to adopt across a range of possible future conditions, by considering a broad range of sustainability performance criteria, alongside effects of the strategies on resilience related to risks and opportunities. The main stages are shown in Figure 2.
The process flow for the new approach was developed using a pilot case study, into a more detailed set of steps which could be communicated to company staff. These are shown in overview in Figure 3. The intervention point for this project, at which the new process could effectively be inserted within company activities, was identified using semi-structured interviews and meeting observations. This point was the use of strategic studies, in which teams of engineers, specialists and managers prepare information and recommendations for decision-makers at higher levels. This information is used in iterative, multi-level and multi-function decision-making loops to alter or create strategies at Ford, which may concern technologies, products and services or even business models.

2.0 Testing the new process

Next a process instruction manual and some simple training examples were created. Further case studies inside Ford were used to test its validity in real situations and to investigate whether it could provide the desired beneficial effects for its users. As many of Ford’s strategic decisions are on future products which are commercially sensitive, and this limits the ability to publish the research results, further organisations were approached for case studies. These consisted of a nearby (non-automotive) Small to Medium-sized Enterprise (SME) manufacturer, and a non-educational department of the University.

Managers and their teams were chosen for participation in the research who said their teams already encountered issues associated with environmental or social impacts of their organisation’s activity or products, and who therefore had an interest in
integrating these issues within their work. Interviews recorded their existing approaches to strategic studies and strategic decision-making, before training the teams in the new process using a facilitated workshop.

Fig. 3– The 8 steps of the SuReSDSTM process flow

The teams then applied the SuReSDSTM approach to a real-world strategic study they were working on, facilitated and observed by the researcher. After either a complete pass of the process steps, or as many as could be accommodated in the available time, feedback was sought using a short questionnaire and further interviews.

3.0 Case study results

The case study samples which have been completed and analysed so far have ranged from early product-service concepts, through business plans and technology roadmaps, to capital-asset planning strategy processes. The original pilot case study at
Ford provided confirmation that the approach was logically valid within quantitative studies, by reproducing results from a previous study, before exploring which extra insights might be gained from using SuReSDSTM. As a result of the aforementioned confidentiality concerns, this paper illustrates the results primarily using an early case sample where SuReSDSTM was used at the SME.

3.1 Butyl Products Ltd case study

Butyl Products Ltd is a medium-sized UK manufacturer serving several sectors. Amongst these they make aid and development equipment for charities, governments and other organisations, focusing on kits for water-related needs such as sanitation and hygiene. The study concerned the business case for, and design of, a new product, which the company wished to offer in response to an unmet hygiene need for end-users identified by customers at a recent sector workshop. This case sample was also a pilot study in that this was the first time the approach was utilised by ordinary business people outside the research project.

There were two elements to the case study design:
- Checking that SuReSDSTM would reproduce similar results during its process, to an original qualitative analysis; to show whether as an analysis approach it is logically valid.
- Testing whether SuReSDSTM produced extra information and insights. This investigated whether it enabled users to integrate resilient sustainability into their strategic choices as intended, and whether it produced extra benefits to justify the effort required to use it.

3.1.1 Methodology for applying SuReSDSTM

The new approach was applied to existing strategic information from a current product and business-model study, by the researcher and a specialist from the SME together. An initial analysis was produced, and the results compared to the existing study. The analysis was then extended using SuReSDSTM to look at product function, sustainability, and resilience to issues in the field. This analysis was conceptual (for a new product-service idea) and therefore qualitative rather than quantitative. The specialist was interviewed afterwards to see how useful the experience of using SuReSDSTM had been. They were asked whether it had made the decision process easier and whether it had influenced the choice of strategy, or improved business performance.

3.1.2 Scope phase

The case is explained here in terms of the process steps of the new approach. The first phase is intended to clearly define the purpose of the strategic study, and to set the boundaries of the business model, product or service, or technology to which it is being applied (that is, the system which the strategic decision is seeking to change). It seeks to reframe the study in terms of sustainability and/or resilience issues or opportunities, to check that use of SuReSDSTM is appropriate and necessary.

The design problem to which the process was applied at Butyl Products Ltd relates to menstrual hygiene in aid camps and development projects all over the world. Butyl’s
clients had identified a “wicked problem” in that young women in developing nations can experience problems managing their menses discreetly, frequently staying away from school and other public activities for up to a third of each month. This means they fall behind and often drop out of general education and development projects. This matters because it undermines the social and economic development these projects are meant to support; both generally and for individual females.

Hygiene kits for aid and development treat menstrual hygiene as less important than survival and tend to contain either nothing, simple cloths, or at best Western-style adhesive disposable paper pads. These lead to several issues:

- A complete absence of menstrual hygiene supplies does nothing to alleviate the related issues for women and girls receiving kits.
- Cloths are washable so re-useable and cheap but do not work very well as they are not secure and do not stop leaks. Kits may also lack instructions and cloths may not be laundered or can end up being used for other things.
- Stick-on disposable pads attach to underwear during use and function well; except for cultures which do not wear underpants. Here even if underwear is also supplied, this and the pads are rarely used.
- Even where they are used, the disposable pads create hygiene and waste problems when disposed of after use, and users must be resupplied with new pads at further cost and logistical difficulty. When the camp closes or development project finishes, there may not be a further supply of items and project benefits may be lost.
- Finally there is a common set of issues; lack of hygiene education and lack of suitable materials, or unhygienic use arising from any of these kit options means women and girls using various unsuitable materials and methods to manage their menses. The resulting poor hygiene is thought by Non-Governmental Organisations (NGOs) to account for a significant proportion of female infections and diseases in some countries.

The company’s clients at the sector workshop identified from this that they needed:

- A new design of menstrual hygiene kit which works in all cultures but also functions well generally
- To be combined with hygiene education
- And which is also low-cost enough to be used everywhere, to avoid complexity and related costs in NGO distribution and supply chains.

The NGOs and other sector organisations would supply the education side but needed their suppliers to come up with solutions for the physical items. From this Butyl had identified a potential solution but wanted to check if their intuition that it was the best suitable design solution was correct. They also needed to investigate the business case to see if the required investment in prototypes and business development was justified.

Working with the relevant specialist at Butyl, the case study was identified as seeking to primarily solve a cultural resilience design issue. This was that the best available solution for menstrual hygiene kits, stick-on pads, does not work in some cultures and so this undermines the function of the kit and other aid or development project effectiveness. The design is of a Product-Service System (PSS) in that the pads are providing the service of discreet menstrual hygiene management. This service can be
thought of as the “function” of the PSS, which currently has social (cultural and also various hygiene) issues. The wish of the client NGOs was that these issues should be solved whilst improving (or at least not worsening) the environmental (mainly disposal) and economic (user purchase and/or donor cost) impacts of the system. Therefore the study was confirmed as containing both resilience and sustainability concerns, and so being suitable for applying SuReSDS™.

3.1.3 Create Options phase

If the organisation does not already have strategy or system design options in mind, at this stage some initial options should be created using the simple results from the scope phase. To assess any such option it is necessary to find something to compare it with; either the existing situation without the new design/strategy if it is new, or some existing variant if it is an improvement. The results of other phases of the analysis process can also trigger ideas for more changes leading to further improved function or reduced negative impacts, creating new versions of existing options. In this way SuReSDS™ has been designed from the start as an iterative process.

In this case study the company had identified a solution using a combination of design elements from existing products. They had one design concept which they could supply to customers, and so in order to analyse its benefits it was decided to compare it with the best available external option. The new design was a washable re-useable set of fabric pads combined with an elastic belt, storage bags and laundry soap. The pads were absorbent but shaped and had a waterproof layer (taking the best elements of the paper pads to provide a good basic functionality), and the elastic belt had loops and clips to secure the pads without underwear (borrowing from another older type of paper pad). The use of tough, stain-proof but soft and absorbent fabrics plus storage bags and soap allowed clean and soiled pads to be kept separate, and soiled ones washed for reuse, many times.

Other existing hygiene products such as tampons, washable internal cups or clip-on washable pads, were considered but rejected due to one or more of the following issues:

- Products which are inserted are not acceptable within all cultures
- Inserted products also pose a larger hygiene risk whether or not they can be washed and reused
- Clip-on pads even if washable still need underwear to work

Additionally, some suppliers reviewed or approached to explore sourcing parts of the new design were either uninterested, too small or deemed unreliable commercially.

This left one design and the need to set up a new supply chain to deliver it. The best existing design to which it could be compared was the adhesive disposable paper pads. These have absorbent paper layers with a waterproof backing, adhesive, and packaging. Although the study was conceptual there was sufficient information now available to progress with an analysis. One intention of SuReSDS™ is to allow this type of qualitative analysis which can highlight where further quantitative information is needed.
3.1.4 Identify Stakeholders and Value Flows phase

To compare the different PSSs meaningfully a common basis was needed- a Unit of Analysis similar to that used in Life Cycle Analysis (Baumann and Tillman, 2004). This unit was identified as supplies for one woman for one year- also implying that one new re-useable kit must last for at least this long. The paper pads would have to include 13 sets of 12 to 20 pads for one year. In order to analyse the effectiveness of the new option against this requirement and the external best-existing system, it was next necessary to identify which people and entities (stakeholders) are significantly affected positively and negatively by the system (in this case the menstrual pads PSS) and its functions or malfunctions.

This phase applies Creating Shared Value principles (CSV, Porter and Kramer, 2011). This seeks solutions to social and environmental problems or opportunities to exploit in these areas, to gain competitive advantage by producing more sustainable strategies, products and services. This analysis was developed as a map of stakeholders to identify the flows of different types of value (including social and environmental, positive and negative) between them. The different stakeholders are viewed as belonging primarily to one of the Triple Bottom Line (TBL) categories (Elkington, 2004) of society, economy or environment; according to the main impact the system has on them. E.g., consumers are part of the economy but they hand over their economic capital (money) in order to receive a social service or product and therefore would be placed in the “society” group. The environment (local and/or global) does not in itself own money, but resources are extracted from it, and waste and pollution returned to it, as a result of the lifecycle of economic goods and services. Organisations may represent it as proxies, by passing laws, exacting fines and sanctions or applying societal pressure.

Due to the need to consider the lifecycle impacts of the PSS designs, it was decided that only direct and significant effects of the system could be included on the value flow diagram to avoid overcomplicating it. Effects on areas of the environment such as air pollution do feed back into negative health impacts on all of society; these have to be borne in mind when considering the analysis but are indirect. Both options were analysed, then compared using the value flow map shown in Figure 4. The two designs are shown photographically in Figure 5.

By considering the flows of value the system causes or enables, it is possible to come up with system designs which reduce negative impacts and improve positive ones. Effectively these are looking for more sustainable solutions by better balancing the TBL outcomes or looking for innovative synergies which benefit all areas where possible. In Figure 4 the arrows show flows of value between the stakeholders most significantly affected. The symbols show the estimated relative effect of the new design compared to the old. A + or ++ indicates a smaller or larger increase in the magnitude of a flow, and so on, whilst the symbols are colour coded to indicate whether this is considered a good or bad thing from the viewpoint of sustainability. +/- indicates an unclear outcome needing more work to quantify.
It was later found that this judgement on the changes may vary according to whose viewpoint is adopted— the NGO, the supplier or the user may have a different view of economic impacts in particular, for example. One party may view them as a burdensome cost and another see them as valuable income. The assessment of social and environmental impacts so far has not been as likely to change with changing
viewpoints. The diagram in Figure 3 is drawn from the viewpoint of Butyl Products, as the organisation conducting the analysis.

In this exercise a number of advantages were confirmed for the new design in reducing the major social and some environmental issues. However it also highlighted trade-offs in impacts. The new kit is likely to be more resource-intensive per pad, using fabric, and uses soap and water to clean them; but it also uses far fewer pads in a year and very few are disposed of to the local environment or waste system. When the pads are used in aid camps they would need to be provided in tandem with washing facilities and water. Their appropriateness and associated water impact in development projects is more difficult to assess and will depend on water scarcity and other projects occurring in parallel. This is more a matter for the NGOs to consider but indicates that choices made using SuReSDSTM can be context-dependent. More quantitative information on the lifecycle impacts from each design and the changes in specific impact types, possibly in location-specific analyses would be needed to assess whether the new design represents a general improvement in environmental terms.

Other outcomes were that it is not clear whether NGOs such as charities sit in the “society” or “economy” group of stakeholders. In this case study the differing assessment of strategy effects on certain value flows was not an issue so long as the organisations (in this case both the client NGO and supplier Butyl) seek to balance the benefits and downsides to themselves and other stakeholders; and provided that all the significant stakeholders are included in the analysis. After all, Shared Value proposes exactly this balancing act for companies to become more sustainable (Porter and Kramer, 2011).

3.1.5 Evaluate Options Against Scenarios phase

The PSS function could now be considered in more detail to assess how its resilience can be improved. This phase uses a simplified Parameter Diagram borrowed from Taguchi’s robustness engineering (Karna and Sahai, 2012, FMC, 2011). Using the value flow diagram as the context for the PSS, different elements of its functional design, its input and outputs were identified. This also allowed consideration of feedback effects between different aspects of the system, and which parts of the system design were truly able to be altered by the organisation (Butyl).

It was now possible to define both resilience and sustainability more specifically using the Parameter Diagram. Sustainability is effectively measured within it by the ratio between all of the beneficial impacts of the outputs of the system’s function (the desirable outputs in Figure 5) and all of their negative impacts (undesirable outputs). This could be expressed using a mix of all the TBL types of value or checked by selecting only items which the strategies affect differently. All of the value flows from the previous phase appear in the diagram as one or other type of output. As before, no definite measurements for these value flows existed and only the likely effect of different strategies on these value flows could be considered.

Similarly resilience is the ability of the system to maintain this level of sustainability when disturbed by one of its inputs. This might be a signal (something the system is designed to respond to) or a noise (something it should ignore). The simplest form of resilience measure is therefore how much the output performance changes in response
to an input changing—another ratio representing short term or innate resilience. Over the longer term the system may also recover and adapt which allows for other measures of resilience.

In this case the resilience of interest was the immediate ability of different cultures to use the hygiene kit pads. The populated Parameter Diagram is shown in Figure 5. As before the new and existing designs were compared, and the flows marked with +/- symbols using the same logic.

Fig. 6- System Parameter Diagram analysing function of new menstrual hygiene kit

By looking at how local culture might affect users of the pad, the resilience of the new design could be checked against these. This was effectively forming very simple scenarios of future use in the field. The main signals were the presence or not of underwear, and the new design was confirmed to work better than the old one. However other noise factors were also identified such as the size and shape of users or the intensity of flow they must manage, and these led to some improvements in the physical design and therefore function of the new PSS. The possible need for an ethical supply chain was also highlighted as a potential demand of customer NGOs. This last is probably not a concern for the users but does concern Butyl as the supplier. Figure 6 is also drawn from their perspective.

Once the strategic alternatives have been analysed, users should check that their strategies do improve the performance of the product, service or business model as needed. If not, the SuReSDS process prompts them to return to the hunt for better options. The exception is if the existing strategy is already the best available one.

3.1.6 Choose Option phase

Butyl Products Ltd did not have many strategic options to select between— their decision was whether to develop their design and enter a new part of their market, or
not. Therefore a full comparison grid was not created. When comparing multiple strategies companies would normally use a comparison matrix adapted from Transition Engineering (Krumdieck, 2013, pp 722-728) or a version of their normal format for strategic comparisons, to select their best option.

The specialist at Butyl reported that they individually found the new approach enabled a methodical approach to a complex set of issues. It gave them confidence that they had found the best PSS design, and provided missing information to help them make a strong business case. The staff at the SME generally felt that the exercise was worth the effort and used the extra information to help specify product criteria (e.g. target costs and technical performance) develop prototypes, identify suitable suppliers and approach potential customers.

4.0 Discussion of results

SuReSDSTM reproduced a description of social and environmental issues surrounding the current product, and modelled conceptually how a new product-service system (PSS) might address these. It also allowed a more detailed exploration of how the compared designs affect different stakeholders, and where the new version could improve both sustainability and resilience of the PSS. Additionally some possible negative impacts and context-specific aspects were discovered that required more investigation, to quantify any trade-offs. This allowed the advantages and disadvantages of the new design to be included in a business case and a strategy decision. Finally this study produced clear real-world impacts, assisting in the development of a new more resilient and socially sustainable product.

In terms of Figure 1 the case study succeeded in integrating sustainability and resilience thinking into organisational strategy to manage risks from both negative impacts and uncertainties. This allowed Butyl to make a strong case to customers, resulting in expressions of customer interest; which demonstrates some immediate benefits to the company.

4.1 Other case study results

Two subsequent studies at Ford looked at innovative product designs using trained participants facilitated by the researcher. These showed that the approach is transferrable by training, whilst users again reported that they were better able to tackle sustainability and resilience-related strategy tasks using SuReSDSTM. The information derived was used directly within their real-world projects and highlighted a number of extra opportunities and risks which they were then able to exploit or ameliorate. Further case study samples are planned at Ford, University of Surrey and the SME with trained participants, facilitated and observed by the researcher.

5.0 Conclusions

SuReSDSTM appears to deliver the intended immediate benefits to decision-makers. It has affected some of the choices made in this and other case studies, by identifying new opportunities or risks and providing a methodical comparison of strategic options. If these results are supported by the other case studies the implication is that the approach is suitable for use in both large and small suppliers of PSSs, and possibly
other types of organisation. One limitation however is that companies may need to import or develop sustainability and resilience expertise to be able to continue to use the approach.

Resilient Sustainability as deliverable by SuReSDSTM should therefore provide a competitive advantage to its users by allowing them to integrate sustainability into their strategy more easily and reliably than before. It allows them to look for better synergies between their economic gain and the social and environmental value they deliver to stakeholders. However SuReSDSTM has been designed for organisations which were not previously able to do this; different industries may be better or worse equipped than automotive giants and small manufacturers. It also assumes that the organisations using it wish to integrate sustainability into their decisions; any tool can of course be subverted by a different purpose than that intended. The suitability of SuReSDSTM for other sectors and more firms is one future area for research, together with exploring larger sample sizes.
References


