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Assessing the alignment of sustainability with competitive advantage – A Case Study of Oxford Landing Wine

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Abstract

Purpose: The study is the first to combine Life Cycle Analysis (LCA) with Value Chain Analysis (VCA) in a context that allows researchers, practitioners and policymakers to identify areas for improvement, in what they do and how they do it.

Methodology: Case study

Findings: The case study highlights the importance of taking a holistic view when considering the sustainability of a product, process or chain – trade-offs between environmental benefits and consumer perceptions of value can have significant implications for grape producers, winemakers, retailers and policy-makers.

Keywords: Sustainability, Value chain analysis, Life cycle analysis, South Australian wine, Oxford Landing, Tesco

1. Introduction

Two decades of impressive growth has earned the Australian wine industry a reputation of being a producer of high quality, consistent and affordable wines supported by innovations in grape growing, winemaking, sales and marketing (South Australian Wine Industry Council, 2006). However, in 2009, when the research for this case study was being undertaken, the Australian wine industry was struggling to compete on a global scale, with quality wines accessible to the mass market. Furthermore, the industry was facing a grape glut, with export sales falling dramatically in 2008 and 2009 and the rising Australian dollar making competing wines more attractive to supermarkets and wine drinkers in the UK -Australia's largest export market (Cranitch, 2009).

Various stakeholders in the Australian wine industry recognised the need for change – such as greater attention to customer needs and wants, more effective information sharing for accurate forecasting, more efficient distribution (from vineyard to winery to store), and more sustainable use of resources (especially where water and labour were in critically short supply). However, many were in denial and change was occurring at too slow a pace – for grape producers (who were struggling with declining prices and drought), winemakers (who were struggling with declining prices and excess capacity) and policymakers (who were struggling to support one of the most strategically important industries in the country).

This paper presents a case study of one of South Australia's most progressive (and oldest family-owned) winemakers (Yalumba) and the diagnosis of the supply chain for one of their major export brands (Oxford Landing) to one their biggest customers (Tesco) in one of their biggest markets (UK). It illustrates the use of a diagnostic tool - sustainable value chain analysis (SVCA), which combines value chain analysis to identify areas for continuous improvement, in the creation of value (in the eyes of the consumer) and the environmental sustainability of the supply chain (from input supply to final consumption).

2. Sustainable Value Chain Analysis (SVCA)

The concept of the value chain was first introduced by Michael Porter in 1985, emanating from his seminal work on competitive advantage (Porter, 1985). The chain, as the name implies, represents a linked set of value-added activities and Porter's view was that competitive advantage cannot be achieved by looking at a firm in isolation; and that it stems from the many discrete activities in designing, producing, marketing, delivering, and supporting products and services.

It is generally accepted that final consumers have exclusive rights to the definition of what constitutes value in a product or service (Slater and Narver, 1992) and that firms can only create successful value propositions by understanding what it is that consumers value in the products and services they create and subsequently adapt to suit specific target segments.

Value chain management (VCM) involves the collaborative allocation of resources, within and between the respective businesses in the chain to deliver more value added at lower cost and at a faster rate than competing supply chains. Collaborative relationships facilitate the flow of information (both inbound and outbound) as well as products and services (Lee *et al.*, 2007) and there is ample evidence that collaborative relationships are a key ingredient for economically sustainable supply chains, (see Christopher, 1992; Slack, 1991; Schonberger, 1986; Lamming, 1993; Zailani and Rajagopal, 2005; Kim, 2006; Cousins and Menguc, 2006). Given that opportunities exist for improvement (process, product and service) both within and between firms, it is essential that VCM takes a whole-of-chain perspective (Bonney *et al.*, 2007).

Sustainable Value Chain Analysis (SCVA) incorporates both Value Chain Analysis (VCA) and Life Cycle Analysis (LCA) to determine the value that final consumers attach to the activities that contribute to emissions and the impact on consumer perceptions of value of changes to production processes and product attributes. As this method includes the environmental impact assessment (in this example CO₂ emissions) at all stages in a value chain, in conjunction with the activities, materials and operations, it is able to facilitate more effective resource allocation by identifying priority areas and bottlenecks.

Value chain analysis (VCA) focuses on three key areas (Taylor, 2005; Bonney *et al.*, 2007): First, the dynamics of information in the value chain, from final consumption through to primary production and input suppliers and back again. Second, the creation and flow of value, in the eyes of the final consumer, at each stage in the value chain. Third, the nature of relationships between the different stakeholders, from input supply to retail.?

Life Cycle Analysis (LCA), often called ‘cradle to grave’ analysis, since its beginnings in the 1960s is one of the most comprehensive analytical tools for quantifying the environmental impacts in supply chain operations – e.g. the production, processing, packaging, distribution, use and disposal of a product (Camilleri, 2008). The focus of LCA is on the intensity of resource utilisation (e.g. energy, water) and the environmental impact of outputs (e.g. by-products, waste and emissions) at each stage of the chain, where it provides environmental performance measures, identifying opportunities for improving resource use, reducing environmental impacts and targeting parts of the life cycle where the greatest improvements can be made.

Measuring environmental impacts such as carbon emissions in a value chain, in isolation, is of limited value and potentially damaging to the competitiveness of a value chain, if consideration is not given to the value that final consumers attach to the activities that contribute to emissions (de Bakker and Nijhof, 2002). Consideration should be given to the impact on consumer perceptions of changes to production processes and product attributes that may result from considering an LCA. Integrating the LCA into a value chain analysis supports chain partners’ decision making on how to adapt to carbon constrained markets in ways that improve their competitiveness, brand reputation, and market access.

3. DATA COLLECTION

The Oxford Landing value chain selected for this case study comprises six main stakeholders: Grape growers in the Riverland, South Australia (a region that produces half of South Australia’s grapes and a quarter of Australia’s wine, the bulk of which is exported), Yalumba Wine Company (Australia’s oldest family-owned winery and one of the country’s largest exporters of wine), Amcor (one of the world’s largest packaging solution providers and a major supplier of glass and corrugated packaging and bottle closures to the Australian and New Zealand wine industry), Tarac Technologies (an innovative company that has invested heavily in technologies for value-adding to the residuals from the wine making processes. Tarac Technologies reprocesses most of the residuals from the Australian wine industry), Tesco UK (the world’s second largest supermarket and responsible for 25% of all UK wine sales, making it the single largest overseas buyer of Australian wine and the largest customer for Oxford Landing), UK supermarket shoppers (of which 31 million are wine drinkers, consuming 120m cases per year, of which 25% are Australian, creating a market worth around \$900m to the Australian wine industry in 2009).

The study adopted an iterative process of data collection over a six-month period in Australia and the UK, from June 2008 to February 2009. SVCA involves a combination of qualitative and quantitative research methods covering three distinct areas: consumer value (this involved the analysis of supermarket loyalty card data – to determine who buys Oxford Landing - six focus groups – to determine why they buy Oxford Landing - and an on-line survey of 1,000 UK supermarket shoppers – to quantify the importance of different wine attributes), the three key flows - material, information and relationships (this involved 57 semi-structured face-to-face interviews with key informants from each of the key stakeholders in the chain) and environmental impacts (this involved the interrogation of Yalumba’s own LCA data, compiled by Yalumba’s senior environmental manager over the previous three years, based on environmental management standards, auditing procedures and guidelines which form part of their ‘commitment to sustainable winemaking’ (Camilleri, 2008)).

4. DATA ANALYSIS

4.1 Consumer value

There was a strong consensus in the focus groups regarding the positive images associated with Australian wine being “reliable, good quality, good value, fresh, crisp and fruity”. However, the competitive pricing of Australian wine has resulted in a degree of commoditisation, as the majority of the discussants confessed that they rarely considered Australian wine as a purchase for a special occasion. For many, the purchase of Oxford Landing, like most ‘everyday’ wines, was triggered mainly by a promotion, which in the case of a known brand was difficult to resist and required little effort (and thus attention to the bottle or the label). Thus, few of the discussants saw any link between the concept of sustainability (which was poorly understood generally) and wine, where it was mostly associated with bottle re-cycling). None of them were remotely aware of the sustainability credentials of the Oxford Landing brand and when the information on the back label was drawn to their attention there was a mixture of mild interest and considerable scepticism.

The survey results generated a hierarchy of attributes (Table 1).

Table 1 - Importance of wine attributes (mean scores*)

	Full Sample	All Oxford Landing Buyers	Tesco Oxford Landing Buyers
Price per bottle	5.6	5.6	5.6
Type of wine (e.g. dry/sweet)	5.5	5.6	5.6
Colour	5.5	5.5	5.5
Grape Variety	4.8	5.3	5.4
Which wines are on promotion	4.7	5.1	5.1
Information on the back label	4.4	4.6	4.5
Recommendations (friends/relatives)	4.3	4.4	4.3
Country of origin	4.3	4.7	4.8
Brand name	4.1	4.7	4.8
Specific region within a country	4.0	4.4	4.4
Year or vintage	3.6	4.1	4.2
Recommendation (newspapers/magazines)	3.5	3.8	3.8
Alcohol content	3.5	3.7	3.8
Appearance of the bottle	3.4	3.7	3.6
Type of closure	3.4	3.4	3.3
Environmentally sustainable production	3.3	3.5	3.4
Environmentally sustainable packaging	3.3	3.4	3.4
Design of the front label	3.2	3.6	3.6
Distance the wine has travelled	2.8	3.1	3.0
Weight of the bottle	2.8	3.0	3.0
Suitability for vegetarians/vegans	2.4	2.6	2.5
Number of Respondents	1100	377	181

* 1= Not at all important, 3= Not very important, 5 = Quite important, 7 = Extremely important

These results were used for the classification of physical activities (material flow) along the value chain as value adding (V), Necessary but non- value adding (N) or wasteful (W).

4.2 Material flow and Carbon emissions

Having established what it is that consumers value, the next stage in the SVCA is to walk the chain and map the material flow. The distribution of carbon emissions is then superimposed onto the material flow map (Figure 1). For ease of interpretation, key activities at each stage in the value chain have been classified according to their contribution to the total emissions from the value chain. Activities that contribute less than 1% of total carbon emissions are categorised as having no or minimal impact (X). Activities that contribute 1-5% of emissions are categorised as low impact (L), 6-10% as medium (M) and over 11% as high (H). A brief summary of the attribution of carbon emissions at each stage of the chain is presented in Table 2.

Table 2 - Supporting information for the attribution of carbon emissions

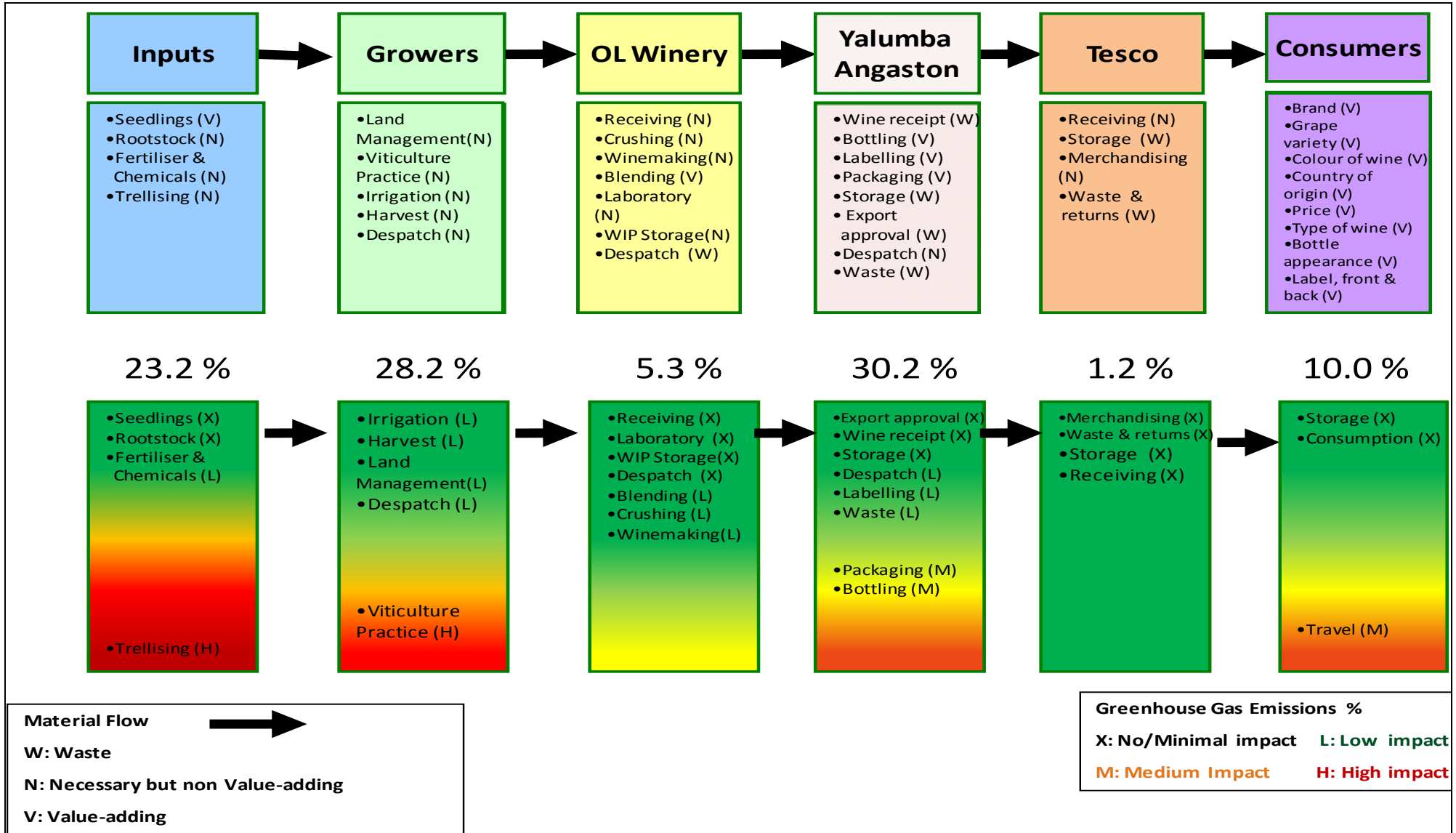
Primary Inputs (23.2%)	This phase refers to the amount of fertilisers and pesticides used; as well as wooden posts deployed in the vineyard trellis system. Trellises are essential to good grape production as they help control vigorous vines, sunlight penetration, spray penetration and air flow around the grapevines. It appears that majority of the vineyards use timber posts, which result in a very high CO ₂ emission in its production phase.
Primary Production (28.2%)	This phase refers to the viticulture in the vineyards, where emission are largely attributed to the decomposition of biomasses, timber decay and sequestration by the vines' growth and production of sugar in the grapes. In addition, land management refers to emissions associated with power, fuel and freight during growth, harvest and transport of grapes to the winery.
Winemaking (5.3%)	At the winery, there are very low emissions from winemaking. The emissions stem mainly from the fermentation and production of grapes during the blending and crushing processes.
Bottling and packaging (30.2%)	At this stage chain emissions are largely attributed to the bottling and packaging of wine. Although this is not emitted at the winery itself, the figure takes into account the CO ₂ involved in the production of glass bottles, pulp and paper products; and wine closures at the supplier level. For instance, glass manufacture is a high-temperature energy-intensive process. When using raw materials, glass is manufactured from sand, limestone and soda ash, all of which are abundant natural minerals. However, both limestone and soda ash are carbonates which generate significant amounts of CO ₂ during the melting process.
Retailing (1.2%)	There is very little CO ₂ emission generated from the export of wine from Australia to the United Kingdom. What is most crucial is not the distance, but the mode of transport used. Sea transport allows for bulk shipments and is far more eco-friendly than airfreight. The figures show that the emission per bottle during export is insignificant.
Consumers (10%)	The emissions at the consumption stage are due to the travel, storage and consumption of wine by the end consumer. At this phase, the purchase quantities are significantly lower than at the chain level. The figures show that transportation of wine from the supermarket to the final consumption signifies a rather high CO ₂ emission per bottle.

The analysis highlights the dominance of necessary but non-value adding activities, which indicates that the scope for adding value to Oxford Landing is somewhat limited. It is evident that there are relatively low emissions occurring downstream (retail and final consumption) and substantially higher emissions occurring upstream (particularly from trellising and viticulture practices) and at the winery (particularly bottling) and embedded in the packaging, which together account for over half of the total carbon emissions from the chain.

The combination of the emissions data and the categorisation of activities in the material flow from the consumers' perspective provide valuable insights for decision-makers and the prioritisation of R&D. For example, trellising systems are the single largest contributor of emissions in the value chain, and might therefore warrant prioritisation in an effort to reduce the chain's carbon footprint. However, this activity is undertaken during the establishment of a vineyard and is therefore a difficult and costly activity to change at a later date. Moreover, the fact that consumers attach no value to it (the sustainability of the production process was of little

importance to the majority of consumers surveyed) means that there is no incentive for growers or the chain to tackle this source of emissions – unless, of course, technology is forthcoming which provides low energy trellising at a lower cost. Failure to recognise the lack of value attached to this

Figure 1: Material flow and Carbon emissions in the Oxford Landing Value Chain



activity by consumers could, in theory, result in capital investment and/or R&D expenditure being directed towards more sustainable trellising systems, in the expectation that consumers would be willing to pay more for the final product, as a result of the reduced carbon footprint and increased sustainability of the production process. Instead, this analysis suggests that in the absence of any other commercial benefit derived from reducing the related emissions, government R&D funding may be required to investigate how best to tackle this source of greenhouse gases.

4.3 Information Flow and Relationships

The effective flow of information, within and between organisations in the value chain, improves the visibility of operations (purchasing, manufacturing, distribution, retailing) and their outcomes (inventory, waste, sales, returns). This in turn can lead to improvements in operational performance (Armistead and Mapes, 1993; Berry et al., 1994; Gavirneni et al., 1999; Lee and Whang, 2000; Kent and Mentzer, 2003; Mentzer et al., 2004; Patterson et al., 2004; Barratt and Oke, 2007). However, the effective flow of information between organisations requires a collaborative approach to business relationships and a degree of trust between supply chain partners. Business relationships are therefore a critical enabler for the effective flow of information and the efficient operation of the chain as a whole. (Christopher, 1992; Closs et al., 1998; Lambert and Cooper, 2000; Spekman et al., 1998; Whipple et al., 2002).

Information flow and the nature of relationships in the Oxford Landing supply chain was assessed through the semi-structured interviews with people responsible for different functional activities (e.g. quality control, sales, and distribution), at different levels (e.g. operational or strategic) and both within and between supply chain partners.

Overall, relationships in the Oxford Landing supply chain are strong – we found little evidence of dysfunctional conflict or opportunistic behaviour and several examples of trust and commitment. However, the flow of information was not so strong, particularly consumer information, which rarely extended beyond highly aggregated sales data or beyond the domain of the winemaker – growers and input suppliers are blind to consumer preferences and Yalumba's knowledge of sustainable wine production far exceeds its knowledge of wine consumers.

Input suppliers and grape growers

Yalumba provided viticulture advice direct to their growers, and had a policy of keeping prices as stable as possible (“Never the highest; never the lowest”), which contributed to long standing relationships with many growers. However, to ensure the smooth flow of grapes to its winery, Yalumba exerted complete control over timing of grape harvesting, which frustrated some growers. Some growers also wanted more feedback on grape quality.

Yalumba: internal value chain management

Unanimously, employees liked working for Yalumba. Its family culture was cited widely as a major contributor to high job satisfaction, with many interviewees saying they sacrificed willingly the higher financial rewards available elsewhere. This resulted in long term stability at all levels of management. However, while feedback on company performance was effective, there was less clarity over both strategic direction and the reasons behind particular decisions. The procedures and systems typical of large companies were not present or not uniformly administered, for example departmental and individual key performance indicators

and staff appraisals. The reported informality of information flows meant some people feel under-informed, especially across departmental boundaries. The operational information flow between production/bottling, warehousing/logistics and sales could have also been improved in terms of the visibility of forecasts, orders and production schedules.

Amcor and Yalumba and Tesco

Yalumba were customers of three Amcor divisions (glass, corrugated packaging and closure systems). In each case, Yalumba were significant customers, though still representing only a part of the total market, and the firms had worked together to develop light weight bottles, for which Yalumba had limited exclusivity rights. However, some of Tesco's requirements, such as shelf-ready packaging, required thicker cardboard, involving more raw materials, which ran counter to the chain's effort to reduce its environmental burden.

Yalumba and Tarac

Tarac Technologies re-process the waste from wine making in a closed loop system which produced inputs for the wine industry. Their relationship with Yalumba was transactional. For example, Tarac rarely received information directly on what days/volumes Yalumba were crushing, which contributed to Tarac's challenges with storing waste product prior to processing.

Yalumba and Collotype Labels

Collotype produced all Oxford Landing labels, and had developed the Wine Find tab at Yalumba's request, and Yalumba had exclusive rights for one year. Yalumba's importance was reflected in Collotype's introduction of an additional bespoke quality check by its production manager to prevent problems.

Yalumba and Marcus Design (labels)

The relationship was long standing, but the consumer research revealed that there was scope for greater alignment between designs and consumers' requirements from labels, in particular providing an explanation of what food went best with the wine.

Yalumba and Logistics Suppliers

In both cases, the relationship was effective, but only transactional, without long term contracts. However, Yalumba's forecasting of requirements was adequate for efficient planning.

Yalumba and Negotiants UK

Negotiants UK are the independent import/export arm of Yalumba, with Oxford Landing representing over 70% of its business by volume and value. However, it lacked autonomy, referring back to Yalumba's head office for most decisions, constraining its ability to respond to the dynamic marketplace. Nor was it involved in developing the Oxford Landing marketing strategy, and had very limited access to consumer data and research beyond sales figures, preventing it from contributing quantitative consumer-intelligence into the relationship with Tesco, rather relying on unrepresentative qualitative data or generic consumer reports.

Yalumba and Tesco

Around 30% of Oxford Landing sales were made via Tesco. Tesco rated Yalumba highly, and the products were recognised as offering good value for its price point. The

characteristics of Yalumba (being family-owned, with a long history and commitment to sustainability) were recognised as supporting Tesco's vision for a rounded category, although the impact was impossible to quantify, and may only affect ranging decisions rather than sales negotiations. Logistically, Tesco rated them in the top ten performing suppliers.

Historically, Tesco and Yalumba's strategies had been aligned, with Tesco seeking to attract new consumers to wine and educate existing customers to grow both volume and value of sales. However, at the time of the research, the global financial crisis was driving an even closer focus on price-competition between UK supermarkets, and hence their suppliers. Accordingly, Yalumba's policy of protecting the Oxford Landing brand by resisting heavy discounting was running counter to Tesco's priority of attractive promotions. Although Yalumba, via Negotiants, could propose an annual promotion programme, Tesco retained control, and given Yalumba's historic reluctance to use deep promotion mechanics, Oxford Landing was not prioritised for Tesco's prime promotion slots.

In terms of information flows, Tesco had only occasional communication with Oxford Landing's General Manager and Yalumba made little use of the consumer data available from Tesco's Clubcard.

Negotiants UK and Tesco

Tesco primarily dealt with Negotiants, rather than directly with Yalumba. This chain was one of over one hundred and fifty wineries supplying over one thousand different wines, and accordingly Negotiants had to compete hard for attention, and communications was occasionally difficult. Yalumba's policy of protecting the Oxford landing brand meant Negotiants were at risk of being marginalised compared to larger suppliers who had the financial resources and brand strategies to offer deeper promotions.

Overall, the Oxford Landing chain is characterised by efficient material flow, reasonable information flows and strong relationships. However, the ability to accurately predict short and long term supply and demand can be challenging, costly (in terms of wasted investment) and result in missed opportunities for Yalumba. Thus, the greatest opportunity for improvement lies in leveraging already strong relationships, to improve the flow of information (strategic and operational) and enable more effective forecasting of supply and demand.

5. DISCUSSION AND CONCLUSION

The objective of this case study was to explore the value of Sustainable Value Chain Analysis (SVCA) as a tool for promoting better alignment between the allocation of resources in the supply chain industry and consumer preferences in a specific target market. The case study shows how existing practices and assumptions about what it is that consumers value and where it is that emissions occurs can be effectively challenged by combining diverse datasets and mapping the results in a way that highlights 'hotspots' and specific areas that warrant attention.

What emerged from the SVCA is that there are complex trade-offs between the activities that consumers value and those that are responsible for carbon emissions in the Oxford Landing supply chain and this supply chain is well equipped to manage the challenge

of maximising commercial returns in a socially and environmentally sustainable way, given the strong relationships that exist, at almost all stages of the chain. However, the weak information flows indicate that the key stakeholders in the chain have yet to grasp the potency of these relationships and use them to make more use of the information that exists – about what it is that consumers value and where/how emissions can be reduced – for their collective competitive advantage. The opportunity exists to differentiate Oxford Landing as a ‘sustainable’ wine brand but to do so the chain (and particularly Yalumba/Negociants/Tesco) need to do much more to raise awareness of sustainability amongst wine consumers, increase their knowledge about the production process and the impact on the environment, change their attitudes towards the wine purchasing process (to look beyond the first promotion on the gondola end) in order to, ultimately, change their purchasing behavior through a re-ordering of preferences for wine attributes.

The case study also demonstrates that the value of emissions data as an input to sustainable value chain management and decision-making is enhanced substantially when viewed alongside the categorisation of activities in the material flow analysis, in which consumer value is used to categorise the physical activities undertaken. The combined information highlights the most promising opportunities, such as eliminating wasteful activities and identifying activities which offer the greatest scope for adding value to consumers through improved environmental performance. The results of combining VCA and LCA enable a more reasoned risk analysis to be weighed as a factor, assuming that truly sustainable competitive advantage requires firms in any industry to serve those markets which are most valuable in a manner which is ecologically sustainable. This allows the chain to make decisions on resource allocation based on what consumers value (and what they do not value), then to prioritise this allocation based on their impact on the commercial and environmental sustainability of the chain and its products.

Commercially beneficial initiatives offer the most attractive solutions to the challenge of sustainability. However, if they are insufficient or ineffectively pursued, there may be a need for government to introduce alternative, and typically less efficient, interventions. Accordingly, SVCA has the potential to better inform discussions between government and industry by providing a basis for assessing the alignment between sustainability and competitive advantage. For example, the case study illustrated the potential for SVCA to inform government’s sustainability policy and how to achieve its objectives through the most economically efficient and practically effective programs and policies. Essentially, if consumer values are aligned with government’s objectives, the latter might be achieved most efficiently through establishing and promulgating consumer insight. This would encourage the development of commercial strategies predicated on exploiting these values. Conversely, where purchasing behaviour does not support government’s aims, alternative strategies and interventions will be required. The same logic can be applied to social policy outcomes, such as dietary-related health, or economic outcomes, such as the extent of demand for locally-produced food and drink.

6. LIMITATIONS AND SCOPE FOR FURTHER RESEARCH

There are limitations to the study being confined to a particular chain and focussing on a single product, i.e. Oxford Landing wine to the United Kingdom. The researchers acknowledge the complexity of assessing a product family or a range of products within an organisation or entire chain, which limits the generalisation of our findings. Secondly, LCA is

a technique for assessing the potential and real environmental damage during all stages of a product's life including energy, raw materials, land use and wastes in the liquid, air and solid forms. This study only measured CO₂ emissions at various stages in the chain as we argue that carbon labelling is predominantly used in LCA and deemed as credible, cost effective and relatively easy to communicate. Thirdly, SCVA is an intensive, time-consuming and expensive methodology, notwithstanding the difficulties of securing agreement and participation of every major player in the chain.

This study places an important peg in the ground, but to create motivation to adapt and adopt this approach on a larger scale we will need to be able to measure the benefit to the extended enterprise; move from diagnosis to benchmarking and problem solving. This will require additional research on the same chain as it moves to embed these practices within its business. We also need to adapt some of the visioning tools from other industries to allow collaborative innovation and problem solving to focus on how to change how things happen now to how we would like them done.

Australian wine companies and community are well versed and accepting of the value of viticultural and winemaking research, and through practical extension adopt the research. However, they are not as accepting of research into less tangible areas such as consumer insight, information flows and strength of relationships and consequently the diffusion of the knowledge gained from the research, and adoption of the research, was challenging and limited.

This was compounded by the complex nature of bringing together value chain research (an area that few had heard of and even fewer understood) with life cycle analysis (an area that is growing in exposure but also poorly understood). The combination of the two forms of analysis that are poorly understood, created an environment that challenged wine industry leaders leading to fragmented diffusion and uptake.

For better uptake of the conclusions of the research and ongoing research, a capability and knowledge development plan must be implemented from the initiation of the research coupled with ongoing diffusion throughout the project, with educated and committed champions embedded in the industry for extended follow up and reinforcement of the value of the research and implementation of the findings.

Despite these limitations, there is scope for further research to provide meaningful findings using different products from various chains, which could strengthen the applicability of SVCA in other industries. Furthermore, we propose carrying out an online survey with various organisations producing similar products as a more cost effective approach so that analysis can be carried out at an industry level. We believe that this methodology could offer important implications to supply chain researchers, practitioners and government departments by providing important information on the sustainability of any product, process or chain which in turn, allows managerial and policy decision making for improving the competitiveness in supply chains and industry sectors of the nation.

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