The role of expectations and values in maintaining supply chain relationships

Discussion Paper

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1 Introduction

Maintaining a supply chain requires both (i) establishing and maintaining trusted relationships between the involved parties, and (ii) ensuring that the flows of goods, services and information are coordinated in an agreed fashion. While the second requirement has already been addressed by prior developments in supply chain and business process management and automation software [2, 3], I argue that the first requirement is significantly lacking in software support and needs more research emphasis.

This paper focuses on the veracity [10] of interactions in a supply chain, illustrated in the context of organic wine production. Figure 1 gives a view of the various parties that might be involved in an organic wine supply chain in New Zealand. This involves growing organic grapes in a vineyard, the production of wine in a winery[1] and the distribution of the wine through wholesalers and then retailers to consumers. The storage and transport of goods is represented as the process of "handling" [8]. Each party may have additional suppliers (e.g. of organic compost for the vineyard and labels for the winery) and service providers (e.g. for spraying weeds). To provide assurance to consumers that a claim of the wine's organic status is credible, a certification authority (here I use the example of BioGro New Zealand) imposes rigorous requirements on the key parties along with a code of conduct. Gaining and maintaining certification involves a specified application and annual auditing processes, with strict requirements for record-keeping [9].

2 Expectations in supply chains

In Figure 1, the solid arrows indicate the flow of goods and services. The dashed arrows indicate some of the *expectations* that the parties may have of each other. I use the term "expectation" in the sense of Castelfranchi [1]: essentially an uncertain predication about the future along with a goal to know whether that prediction turns out to be correct. I also consider that expectations can involve information about the present that is not yet known with certainty. Expectations can arise for various reasons. In the organic wine supply chain these may be due to obligations imposed by the certification authority, the code of conduct or contractual arrangements, or there may be unformalised expectations about shared beliefs and values that guide the choice of partners and the degree of monitoring of others that is performed.

At the top of the figure, bidirectional expectations are shown between the BioGro certification authority and the main parties in the supply chain. These come from three sources:

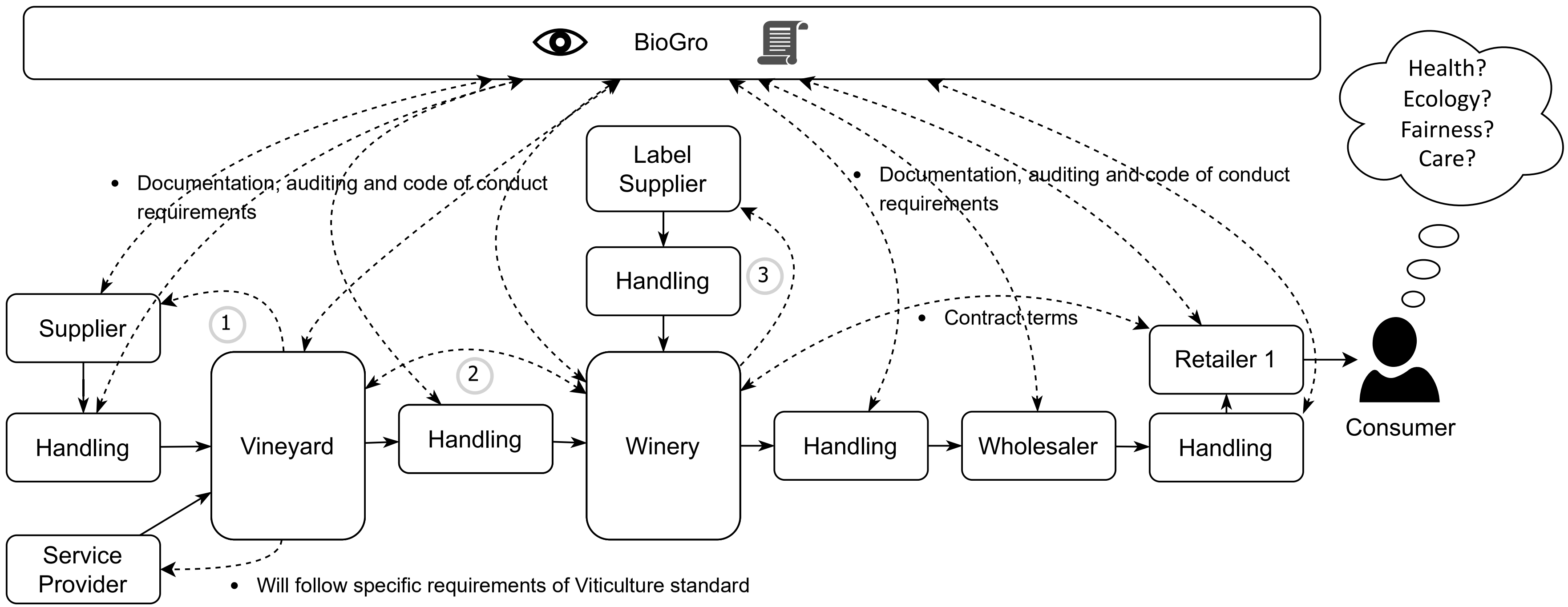
(1) the organic certification requirements, such as allowed input materials, production, storage and transport methods and record-keeping,

(2) the code of conduct governing the certifier and certified parties, and

(3) the workflow specified by the authority.

The expectations arising from source 3 relate to conformance with the specified certification process, and are likely to be well supported by existing workflow and business process management systems. Therefore, I focus on sources 1 and 2. For source 1, it is tempting to propose that the certification process could

[1] Here, I assume that the winery is a separate business from the vineyard, but this is not necessarily the case in practice.



1
- Supplier 1 (S1) is certified to supply their inputs to organic production (BioGro Module 22)
- S1 will notify if certification suspended (or just rely on checking https://www.biogro.co.nz/find-inputs-for-organic-production)
- Know about any "corrective action requests" (but maybe those are private)
- Ownership not changed
- Value: Worker rights respected (BioGro Module 3, §7.12)

2
- Other party certified
- Other party will inform if certifcation suspended
- Contract terms
- Shared values (e.g. IFAOM norms)

3
- Supplied labels are as approved by BioGro
- Value: Worker rights respected (BioGro Module 3, §7.12)

Fig. 1: Example parties in an organic viticulture supply chain. Example expectations are shown using dashed arrows.

be made more reliable and efficient by developing and deploying new software tools to support the process. However, it is not clear what industry demand exists for this. The certification process is run by a single authority and involves detailed standards that rely crucially on human advice and judgements made during site visits. Supporting the BioGro code of conduct (source 2) may raise interesting new requirements for computational modelling and automation, but the BioGro code of conduct is not publicly available, so I do not consider this further.

Many of the certification requirements will, in fact, only be considered as part of the relationship between the party seeking or maintaining certification (the certification client) and the authority. I consider that recording these requirements and tracking their status *within the context of this relationship* is the job of the certifier's workflow management software and client portal. However, some certification requirements will lead to expectations amongst different *certification clients* involved in the same supply chain. I believe that there is scope to provide new forms of computational support to allow these parties to maintain and reason about these peer-to-peer expectations.

Figure 1 illustrates some possible expectations that may arise between certification clients. These include the following:

- Each party will expect their suppliers to hold and maintain the relevant certification for use of their products in organic production.
- They may also expect to be notified if a supplier has a change in ownership.
- The vineyard management may expect the winery to hold and maintain organic certification, to safeguard the vineyard's reputation.
- Each party may expect their immediate upstream and downstream partners to follow norms expressing shared values, e.g. the International Federation of Organic Agriculture Movements (IFAOM) Norms [6], which include a commitment to long-term organic management and respect for worker's rights. The connection between values and norms is discussed in the next section.
- Expectations arising from contractual agreements between partners.

Computational support for these expectations could include a standardised terminology, taxonomy or ontology for expressing various types of expectation in a machine-understandable way, a set of templates for common expectation types that could be specialised for a given party's specfic purposes, and automated monitoring for violations and fulfilments of expectations, given relevant event streams and/or shared data stores.

3 Veracity and human values in supply chains

These has been increasing interest over the last 20 years in considering human values when designing software [5, 4], and the alignment of AI systems with human values is now seen as a pressing need [7]. In the context of sociotechnical systems involving artificial software agents, the problem of *value inference*—"the process of identifying values and reasoning about how humans prioritize values" [7]—has recently been highlighted. As a user's impression of the veracity of the parties and processes in a supply chain is likely to be intrinsically linked to their values, there is potential to provide computational methods to identify, track and visualise the degree of compliance with each participant's values across the supply chain.

One difficulty in designing socio-technical systems with an explicit consideration of human values is that they "transcend specific actions and situations" [12] and can be difficult to map to a specific concrete application area. For example, social psychologist Shalom Schwartz proposed a set of ten "basic human values", which was validated using survey and questionnnaire data from 92 countries [12]. Figure 2 shows Schwartz's depiction of these values organised across two bipolar dimensions: openness to change vs. conservation and self-enhancement vs. self-transcendence. People may hold multiple values to different degrees, and making a decision may involve resolving conflicts between values that are in different regions of the circle.

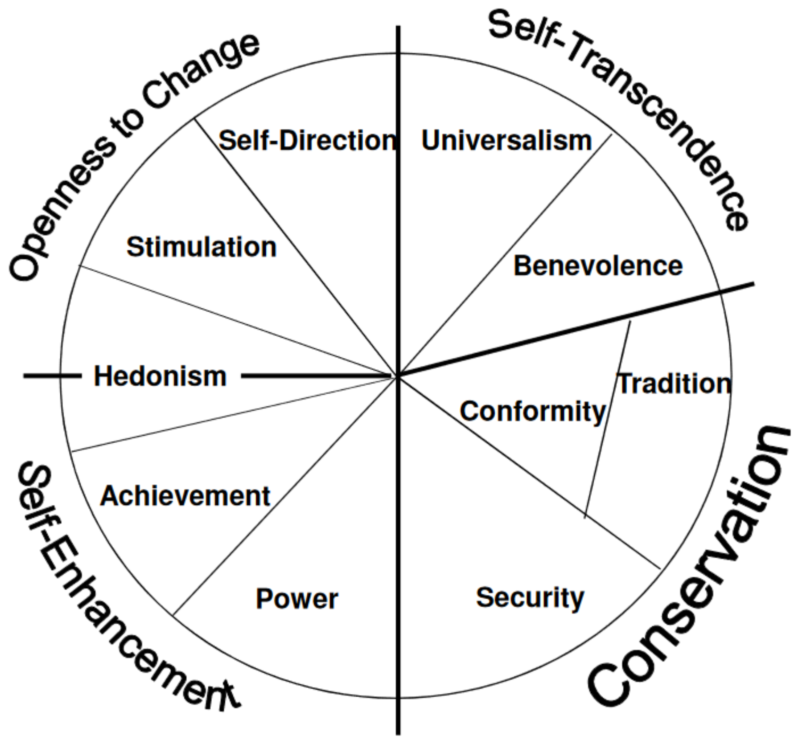


Fig. 2: Schwartz's ten basic human values [12]. Licence: CC BY-NC-ND 3.0

To translate human values into design requirements, van de Poel [11] proposed mapping values to design requirements via an intermediate layer of norms, although his illustration of this begins with domain-specific norms rather than the basic human norms proposed by Schwartz. For example, in the context of chicken husbandry, the value "animal welfare" gives rise to four norms "enough living space", "presence of laying nests", "litter" and "perches". At the design requirements level, the norm of providing enough living space is realised by "1100 cm^2 usable area per hen" [11].

The previous section proposed that tracking the status of norms derived from broader values could be supported as part of a more general ability to explicitly represent and track expectations between parties. In addition, as illustrated on the right hand side of Figure 1, I believe that the final customer's trust in and satisfaction with their purchasing decisions could be significantly enhanced by providing them with the ability to query a product's journey along the supply chain from the perspective of their values. I envisage that an app could be provided to allow customer to select and rank the values they most care about, select from a set of related norms, and then view a visualisation of how well these norms are upheld at different stages of the supply chain.

4 Conclusion

This discussion document has argued that, while there is considerable scope for enhanced computational support to assist various parties participate in a supply chain, the gaps in achieving and maintaining trust (and other forms of veracity) amongst all parties are largely not related to the tracking of process and workflow compliance. Rather, I have emphasised the opportunities to provide support for enhancing veracity in the peer-to-peer interactions between parties, with a specific emphasis on recording and tracking the expectations they have of each other. I also proposed that providing computation support for tracking conformance with human values and norms would help all parties (and especially the final customer) to feel greater confidence in the veracity of the supply chain.

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