# Veracity Technology Spearhead

## Enabling end-to-end veracity within value exchange ecosystems

## *Automated assurance of an organ transplant allocation process*

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**Background**

Society consists of a multitude of people, businesses and institutions that make use of each other's goods and services. These individual parties have their own goals but must exchange information with others to achieve these goals, often with no overarching authority monitoring these interactions.

This project investigated a computing technology: the expectation event calculus, that allows the expectations that each party regarding the expectations of other parties to be modelled and monitored, so that expectations and their fulfilment and violation can be detected automatically and communicated to human users. Delegating this task to software can help to avoid breakdowns in communication and trust, and can be used to trigger repair actions when necessary.

The project prototyped modelling of the process of human organ allocation, in which many agreed rules govern the matching of donor organs to patients, and coordinate transport of the organs.

**Relevance of findings to Aotearoa New Zealand**

Aotearoa New Zealand has a small population spread across a wide geographical area. Further, recent OECD reporting has indicated that SMEs (0–49 employees) make up 99% of Aotearoa New Zealand businesses.

The above aspects may challenge achieving efficient and trusting collaborations between multiple businesses and other organisations, compared to countries with higher populations, larger cities, and more concentrated hubs of business and technology. Software tools that can help organisations to sustain efficient and trusting interactions can therefore help Aotearoa New Zealand and its supply chains to remain efficient and competitive on the world stage.

**Main research findings**

Various "narratives" of events were encoded in the expectation event calculus to illustrate different types of expectation that might occur in the organ allocation process.

These scenarios motivated the development of a number of extensions to the expectation event calculus itself, to increase its expressive power to the extent needed to encode the human organ allocation processes.

The extensions included:

- Recording the actor that performed an event;
- Providing the ability to model more complex types of expectation such as those that become active after a delay, are expected to be fulfilled within a certain time period, or are relaxed during particularly busy periods; and
- Expectations that are cancelled if the rules that had created them previously are removed.

Functionality was also added to detect and statistically evaluate patterns of suspicious behaviour, with the particular test case of a doctor that consistently favours one testing laboratory that is not frequently used by other doctors.

User interface issues were also considered. An approach was developed to display the chain of evidence leading to an organ allocation decision. It was also shown how the state of the expectations could be dynamically shown graphically in a 'dashboard' layout to allow a human to monitor the allocation process.

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