

Appendix A: Unified Foundational Ontology

To exemplify the recommendation-based business process modelling, a subset of UFO (Figure 1) was used. The top-level element is a *Universal*. It represents a classifier that classifies a set of real world individuals and can be of four kinds: *Event Type*, *Object type*, *Quality Universal* and *Relator Universal*:

- An object type is existentially independent universal which can be further specialized in a *Mixin type* and a *Sortal type*. A *Sortal type* supplies a principle of identity to its instances, while instances of *Mixin type* do not carry identifiers, as for example, Colored object. *Sortal type* can be *Rigid* (base type) or *Anti-rigid* (role and phase types). Rigid sortal implies that every instance of this type is necessarily its instance in all occasions; if Lana is an instance of Person, she will always be an instance of Person, hence Person is a *rigid* sortal. At one point, Lana is an instance of Teenager, and as she grows, she will not fit under Teenager anymore and this will not change her identity. So, Teenager is an *anti-rigid* sortal. Teenager constitutes a stage of individual's life cycle, hence it belongs to *Phase type*. The last subtype of sortal is Role type. *Role type* stands for a role played by an individual, for instance secretary, doctor, etc.
- A *Quality universal* is instantiated by qualities possessed by Object types, such as color and temperature.
- A *Relator universal* classifies mediators that mediate two individuals, as for example, medical treatment mediates a hospital and a person. A such a Relator universal is an objectification of a Material relationship between two or more Universals.
- Finally, an *Event type* is instantiated by an event. Events, in contrast to objects, qualities and relators are individuals composed of temporal parts, they happen in time, in the sense that they extend in time and accumulate temporal parts.

For a full explanation of UFO we refer to (Guizzardi et al. 2015).

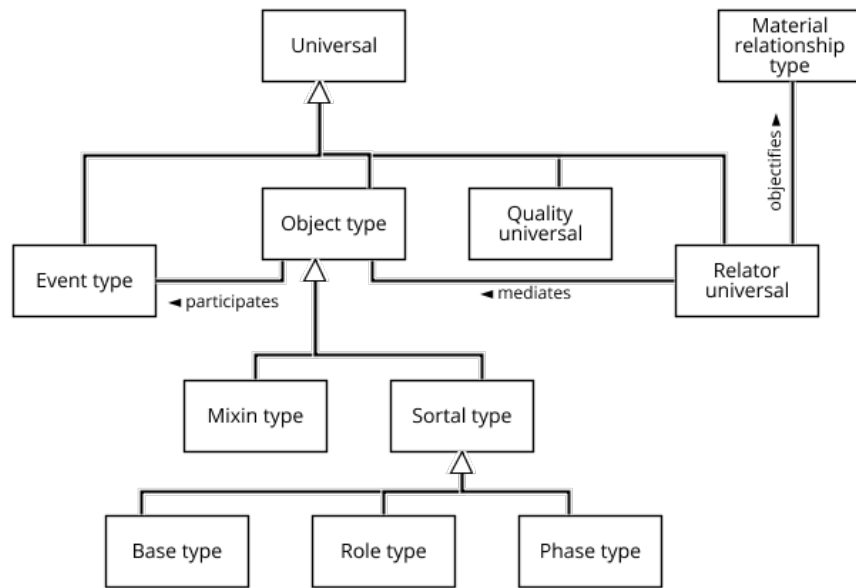


Figure 1: Fragment UFO