

## Appendix A: Unified Foundational Ontology

To exemplify the recommendation-based business process modelling, UFO-U (Figure 1) was used. The top-level element in UFO-U is a *Universal*. It represents a classifier that classifies a set of real world individuals and can be of four kinds: *Object type* which is instantiated by any individual that carries a principle of application, such as person, car, etc. *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. *Quality universal* is instantiated by qualities possessed by Object types, such as color and temperature. *Relator universal* classifies mediators that mediate two individuals, as for example, medical treatment mediates a hospital and a person. *Event type* is instantiated by an event. Object types can be related through Reference Properties, which are Material relationship types. Those Material relationships are mediated by Relator universals. For a full explanation of UFO-U we refer to (Guizzardi and Wagner 2010).

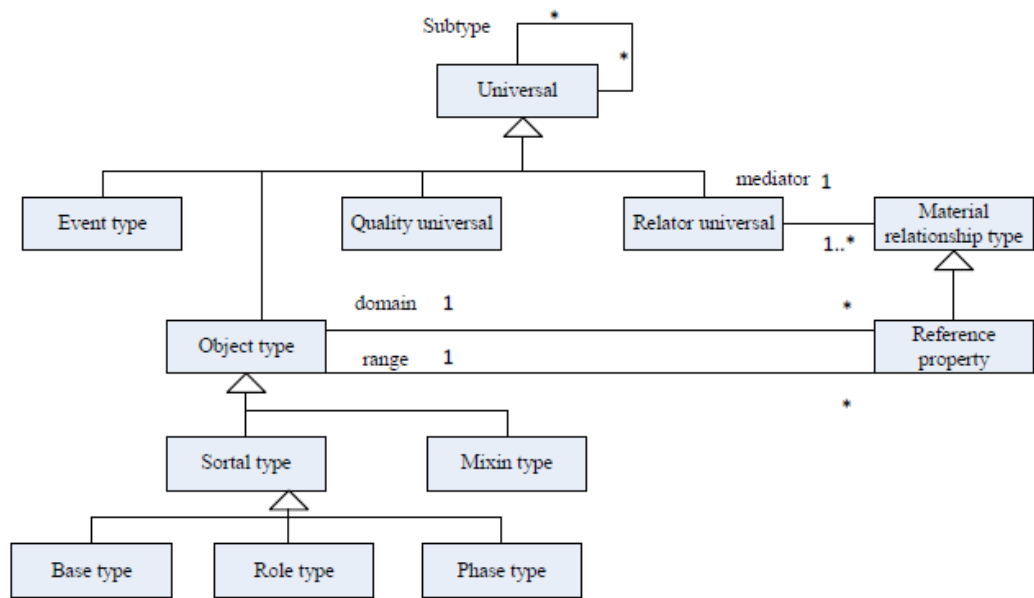


Figure 1: UFO-U