Investigating Worldviews with Protégé

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Abstract. This paper offers a discussion of the usefulness of the ontology editor Protégé 5.0 as a tool for working with qualitative data. As an illustration we focus on an ongoing research project on the worldviews and beliefs of three groups of religious and spiritual professionals in Denmark. It is argued that the use of Protégé in this case can provide important new insights. It is also argued that Protégé can reveal unforeseen relations and give rise to interesting questions for further research. However, it is finally argued that this Protégé approach can only catch some of the aspects of a worldview.

Protégé 5.0 was developed at Stanford University as a tool for making ontologies for use in biomedicine (cf. protege.stanford.edu). It is a graphical editor that gives the user a clear and intuitive approach to definition of classes, relations, instances and data properties. On top of this, a series of useful plugins have been developed like the DLquery tool which we will use for queries into the ontology.

In this paper we focus on how the ontology editor Protégé can be utilized as a conceptual tool in working with qualitative data related to worldview analysis. Since the concept of a worldview is close to that of ontology, Protégé would appear to be an obvious tool to use when analyzing worldviews.

A worldview can be conceptualized as an ontology of the answers a person would give to the most fundamental questions about reality. In the words of Nash:

> "A worldview contains a person's answers to the major questions in life, almost all of which contains significant philosophical content. It is a conceptual framework, pattern, arrangement of a person's beliefs." (Nash 1999 pp. 13)

Ontologies, on the other hand, describe the concepts in a selected domain and furthermore the relationships that appear to hold between those concepts (cf. Horridge 2011 & Vidal 2011, 2012). Taking beliefs of a specific group of individuals as our domain for an ontology, suggests that an ontology would suit the definition given by Nash of what a worldview is. According to Nash, the best worldviews "are comprehensive, systematic and supposedly true views of life and the world". However, according to Nash, worldviews can also "suffer from incompleteness, inconsistency and other failings" (Nash, 1999). Since most aspects of life can be analyzed using ontologies, and given the conceptual proximity between an ontology and a worldview, it seems obvious that at least some of the advantages of using formal ontology to categorize and analyze a specific domain would also be present

when using it to conceptualize and understand worldviews of specific groups of people.

1. Protégé and the logical foundation of a worldview

The notion of a worldview, as it is presented by Nash, involves some fundamental ideas about logic and reasoning. These ideas must be addressed and assessed in light of Protégé as a tool, before venturing further. Nash's idea of a worldview is different from that of Kant, who was most likely the first to coin the phrase *Weltanschauung* (Naugle 2002). Naugle has undertaken a study of the history of the concept (Naugle 2002) and documents how the closest neighbor of the term is philosophy, as in *The Oxford Dictionary of Philosophy* in which *Weltanschauung* is described as: "a general world view; an overarching philosophy" (Naugle 2002). For this reason, philosophical questions that arise in formalizing philosophy cannot be avoided as discussed by Merrill and Smith (cf. Smith 2004, Merrill 2010 & Smith 2010). An investigation of their discussion would go beyond this paper, but we consider it a virtue to work with specific worldviews in such a way, that we attempt to deduce as much as possible from as little as possible. What is given is an assumption of Boolean truth values of a number of propositions concerning worldview related affairs, the basic laws of logic, and a basic categorization of the participants.

2. Setting up the worldview study

In this paper we focus on qualitative data from a recent study of worldviews held by the following three groups of religious and spiritual professionals in Denmark:

a) 6 ministers in the national Church of Denmark (Flk-01, Flk-02, Flk-03, Flk-03, Flk-04, Flk-5, Flk-06)

b) 7 ministers in various free churches (Fri-01, Fri-02, Fri-03, Fri-03, Fri-04, Fri-5, Fri-06, Fri-07)

c) 6 healers or so-called alternative spiritual advisors (Beh-01, Beh-02, Beh-03, Beh-03, Beh-04, Beh-5, Beh-06)

These 19 persons have all given rather long interviews (2-3 hours each). A number of worldview data have been extracted from the transcribed interviews. Obviously, this process involves an element of interpretation. However, the interviews can be made available for other qualified researchers who want to check that the interpretation is reasonable. (The references to persons involved in the transcribed interviews have been anonymized as indicated in a-c above, and all ethical rules valid in Denmark have been followed.)

As part of the analytic process the data have been organized relative to a list of selected attributes. The first 13 attributes deal with objective characteristics of the 19 persons. The following 11 attributes describe relevant aspects of the life stories of the religious and spiritual professionals.130 attributes have to do with the beliefs and views of the persons and the remaining 57 describe how the persons act in (inter)religious dialogue and diapraxis.

The life-story attributes and the attributes of beliefs and views are considered dimensions of a person's worldview. Of cause, there are additional dimensions to the ones in this study. But as mentioned by Koltko-Rivera (2004) the researcher in this bottom-up approach to worldviews may only include dimensions relevant to the study. Again, it has to be admitted that the selection of attributes depends on

interpretation and perspective. However, it is also based on thorough scholarly studies of theology and religion in general.

The overall aim of the recent research project is to investigate if and how worldviews shape the practice of religious professionals seen as interreligious dialogue and diapraxis. The project is inspired by a research project by Rachel Goldberg (2009). She identified some minor correlations between the worldviews of American conflict mediators and their actual practice in conflict mediation. However, can correlations be identified to a larger extend? At present where fault lines often are within cultures rather than between them and confessional lines tend to be more irrelevant than earlier, the dimensional worldview seems to be an appropriate way to go. Can an ontology tool such as Protégé (or perhaps FCA tools) help to create unique worldview profiles of the 19 religious professionals and to identify correlations between specific worldview dimensions and the actual practices?

The discussion in this paper will be limited to the 11 attributes describing the dimensions of conversion and religious calling which are supposed to be essential to the worldview of a religious professional. These dimensions are identified in the life stories of the persons in the study, i.e. attributes 14-24. The original attributes are in Danish and may be translated as follows:

14: Has_experienced_turning_points_in_life_of_a_spiritual_sort
15: Has_experienced_a_conversion
16: Has_experienced_a_calling_through_a_decisive_event
17: Has_experienced_a_calling_through_a_number_of_specific_events
18: Has_experienced_the_calling_as_changed_view_of_life
19: Has_experienced_the_calling_as_an_influence_from_one_or_several_persons
20: Has_experienced_the_calling_as_a_spiritual_experience
21: Has_experienced_the_calling_as_a_personal_revelation (e.g. God/Jesus/Mary)
22: Has_obtained_a_fully_united_personal_and_professional_identity
23: Has_obtained_a_partially_united_personal_and_professional_identity
24: Has_become_a_radically_changed_person_through_spiritual_experiences

Clearly, the focus is on what the religious and spiritual professionals have experienced. In particular, the attributes deal with possible changes and turning points in life (conversion, calling etc.). The ambition of the research in this context is to find interesting conceptual and logical relations between the data related to the attributes. The data regarding the attributes 14-24 of the 19 professionals have been loaded into the Protégé system:

Figure 1.
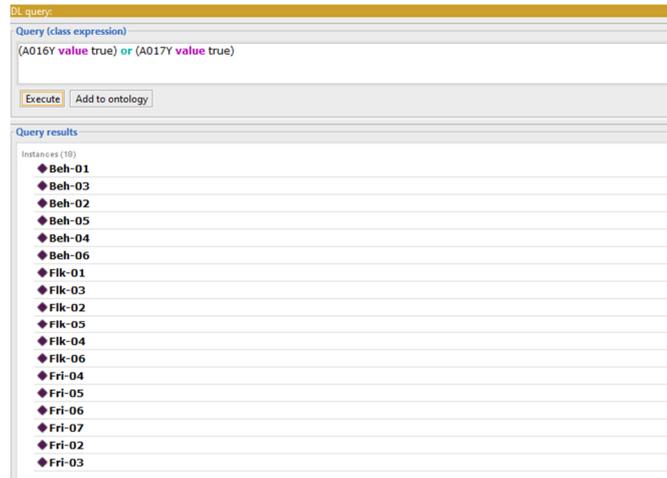Protégé ontology consisting of three groups of religious and spiritual professionals.

Figure 2. A DL Query as whether there are any individuals that has answered yes to the question 16 or 17. It turns out that 18 of 19 professionals have experienced a calling through a decisive event or through a number of specific event**s**.

For practical reasons we attach two formal attributes to each of the 11 items on the above list (e.g. A014Y and A014N, corresponding to 'yes' and 'no' to a question concerning attribute 14 above). This allows us to represent the rather unlikely situation in which neither an attribute nor its negation apply to the person in question. For each of the 22 formal attributes and for each of the 19 persons a Boolean value ('true' or 'false') is given as a result of the interpretation of the interview of the person in question.

Once we have loaded the qualitative data represented relative to the list of attributes into the Protégé system, it becomes possible to explore the data using the system (as indicated in Fig. 2 above). In particular it is attractive and useful to run queries in the system. In the following it will be explained how this kind of exploration can give rise to new and interesting insights.

3. Exploring the ontology by queries

One immediate and rather useful application of Protégé is that it may assist the user in locating typos in the account of the attributes in the system. Based on an early version of the Protégé ontology it appeared from preliminary investigations of the implications of "having a spiritual experience" that

21: Has_experienced_the_calling_as_a_personal_revelation (e.g. God/Jesus/Mary) did not imply

20: Has_experienced_the_calling_as_a_spiritual_experience.

At least in one case it appeared true that the person in question had attribute 21, but not attribute 20. This clearly seems odd. However, this and a few other similar cases turned out to be caused by simple typos in the first account of the attributes in the system. This is in fact a nice illustration of the potential of Protégé with respect to a rather simple, but still important kind of model checking.

Given that all the axioms have been correctly loaded into the system, we may explore the ontology further. By making queries in Protégé we may attempt to find what further classes can be constructed and added to our ontology on the basis of the answers given by the various individuals.

In the following we intend to analyze two interesting notions using the Protégé ontology, i.e., the concepts of 'conversion' and 'calling', respectively. The aim of this discussion it to illustrate how conceptual analysis based on empirical data can be carried out using Protégé.

A Protégé analysis of "conversion"
How do the religious and spiritual professionals represented in the current dataset conceive the concepts of "conversion" and "turning points in life"? In order to answer this question we may run a query in Protégé corresponding to the following logical expression:

(A014Y value true) or (A015Y value true)

This query gives us 17 out of 19 hits. Only Beh-04 and Fri-05 do not fulfill this condition. In fact, it turns out that the query, A014Y value true, gives exactly the same result. The reason is that (A015Y value true) implies (A014Y value true) i.e. if there is a conversion there is also a turning point in life. This relationship may be illustrated by the query

(A014Y value false) and (A015Y value true)

which gives no hits. In order to find the professionals who refer to a conversion in the interview they have given, we should run the query, A015Y value true, corresponding to "Has_experienced_a_conversion". This query gives the hits: Fri-01, Fri-03, Fri-04, Fri-06, Fri-07, Beh-05. Here it may be noted that none of the 6 ministers in the national Church of Denmark refer to a conversion experience. Maybe the talk about conversion as a spiritual experience is seen as somewhat more related to pietistic traditions in the Free Churches, whereas the general approach in the national Church of Denmark emphasizes reasoning and rationality to a higher degree.

A Protégé analysis of "calling" or "being called"
How do the religious and spiritual professionals represented in the current dataset conceive the concept of "calling"? How can it be formulated formally what it means to be "called"? One attempt seems to be that the term could be defined as a disjunction of the attributes 16 and 17, i.e., formally

(A016Y value true) or (A017Y value true)

The corresponding query is shown in Fig. 2. However, it turns out, that only 18 out the 19 professionals are called in this sense. In fact, the statement

(A016Y value false) and (A017Y value false)

holds in case of Fri-01. On the other hand, if we define "being called" using all the attributes in which "calling" is mentioned, i.e.

(A016Y value true) or (A017Y value true) or (A018Y value true) or (A019Y value true) or (A020Y value true) or (A021Y value true)

the corresponding query will display all 19 professionals.

As we have seen above, at least the last part of this long disjunction can be omitted. In fact, it can be reduced to:

(A020Y value true) or (A016Y value true) or (A017Y value true)

This can be read as an interesting disjunction:

> X has experienced the calling as a spiritual experience.
> Or:
> X has experienced the calling through a decisive event or a number of specific events.

The observations indicate that "calling" does not have to be related to specific events in time. Although the calling appears to be time-related in most cases, it may alternatively be related to an ongoing process, probably of a more spiritual nature. Another possibility would of course be that the "calling" is linked to just one specific event which is not considered to be decisive. If we look into the interview given by Fri-01 this latter possibility seems to be the reason in the actual case.

It should also be noted that "calling" does not have to be related to anything spiritual. This is in fact evident from the result of running the query, A020Y value false, which results in 6 hits: Flk-01, Flk-02, Flk-04, Flk-05, Flk-06, Beh-04. It is remarkable that 5 out of 6 ministers in the national Church of Denmark, but none of the 7 ministers in the Free Churches reject the calling as a spiritual experience. In 15 out of 19 cases (including all 6 ministers in the national Church of Denmark) the 'calling' can be related, at least in part, to influence from one or several persons (cf. attribute 19).

It may also be interesting to look into the questions of identity as it is conceived by persons who have experienced some sort of calling as ministers or spiritual advisors etc.. The following query may be relevant for that purpose:

> (A022Y value false) and (A023Y value false)

The meaning of this expression is that the professionals in question have neither obtained a fully or a partially united personal and professional identity. This query gives no hits. The conclusion is obviously that all 19 religious and spiritual professionals have obtained a fully or a partially united personal and professional identity. It is, however, not documented that this feeling of mainly one common identity - in professional as well as in personal life - is caused by the calling rather than by something else. Further studies will be needed in order to answer this question in a qualified manner.

4. Finding a hierarchy with Protégé

As we have seen above all 19 professionals have experienced some sort of calling, if we define the calling experience as

> (A020Y value true) or (A016Y value true) or (A017Y value true)

It appears that the two most significant attributes in this definition are A020 and A016. It is in fact possible to build a traditional hierarchy based on dichotomies using these attributes (see Fig. 3).
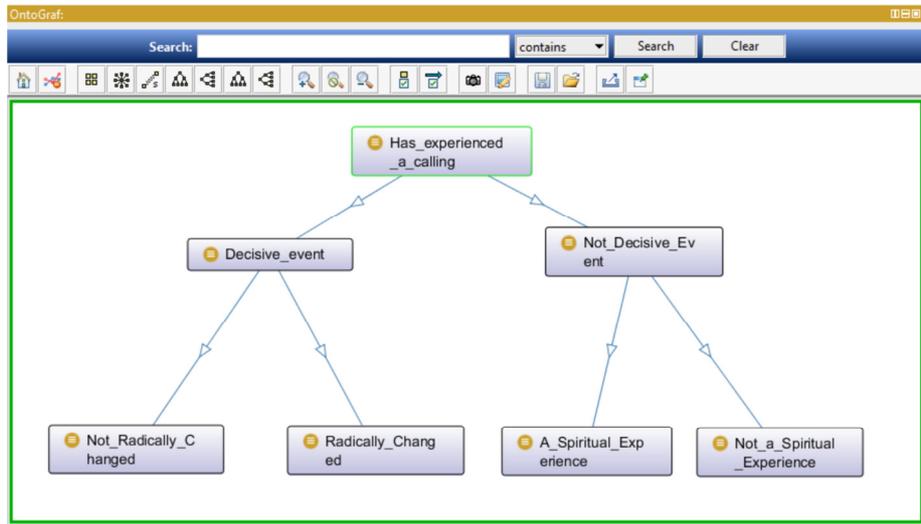
Figure 3. A conceptual hierarchy in Ontograph (as an integrated part of Protégé) mainly based on the attributes in the definition of 'calling'.

By adding A24 as well create a system that divide the group of professional in four sub-groups of almost same size:

A. has experienced a calling through a decisive event and has become a radically changed personality: Beh-01, Beh-04, Beh-05, Beh-06, Fri-04

B. has experienced a calling through a decisive event but has not become a radically changed personality: Fri-02, Fri-03, Fri-05, Fri-07, Flk-05

C. has experienced a calling but not through a decisive event; the calling has been a spiritual experience: Fri-01, Fri-06, Beh-02, Beh-03, Flk-03

D. has experienced a calling but not through a decisive event; the calling has not been a spiritual experience: Flk-01, Flk-02, Flk-04, Flk-06

A-D may be understood as four kinds of a calling experience. It appears that A is mainly (but not only) relevant for healers or so-called alternative spiritual advisors; B is mainly (but not only) relevant for ministers in the free churches, whereas D is mainly (but not only) relevant for ministers in the national Church of Denmark. – It should of course be admitted, that this can only be a tentative suggestion. More data should be collected in order to have it evaluated in a more solid manner.

5. Protégé as a tool for worldview analysis
To what extent is it possible to study worldviews based on a Protégé analysis? Regarding comprehensiveness, it is of course not possible to say much, based on just working with the participants' view on their calling, spiritual experiences and their conversion experience. We have seen, though, that we are capable of systematically categorizing, by logical deduction from answers, what it means to be called, and what it means to have a conversion and a spiritual experience. A further strength of working with Protégé has been that it helped us discover oddities and unexpected aspects of what it means to be called.

A question for further study is how capable persons are to formulate and explain their world views as comprehensive and logically consistent systems. With the ability in Protégé for the reasoner to halt if it finds inconsistencies and output these, it is possible to detect inconsistencies and conceptual problems in the worldviews in a precise manner. Furthermore, Protégé can help us to discover unforeseen aspects in worldviews of the persons involved.

There are, however, also important limitations in the kind of logical approach to worldviews that Protégé can support. In his classical work *Women, Fire and Dangerous Things (1988),* George Lakoff has criticized what he calls classical categorization. Lakoff describes the idea as the view that "reason is a mechanical manipulation of abstract symbols which are meaningless in themselves, but can be given meaning by virtue of their capacity to refer to things either in the actual world or in possible states of the world" (Lakoff 1988). Lakoff calls such a view "mind-as-computer", and approaching worldviews with Protégé could be considered as reducing worldview to something a computer can handle or even be ultimately comprehended as a programmed formal ontology. We may also refer to the observation mentioned by Clement Vidal:

> We should however already be aware that the danger of emphasising coherence too much is to build an abstract system of concepts, very coherent, but that would be too far from reality. So, we should certainly add that coherence must not only be *internal* to the system, but also *external*, with "facts" or "reality". This dynamic is similar to the well known mutual feedback between theory and experience in scientific enquiry. (Vidal 2011, p.14)

Vidal has maintained that religious worldviews tend to be complete but incoherent (Vidal 2011, p.15). However, it may be argued that this is probably the case for all comprehensive worldviews, at least in their common sense versions.
Futhermore, it may be relevant to consider Søren Kierkegaard's much more existential translation of the German *Weltanschauung* as the Danish "livssyn" (in English: "view of life"). According to Naugle:

> "Here a lifeview is described as an "unusual illumination about life" which is granted as a *kairos* moment in one's experience. It consists not in an understanding of everything but rather supplies the key (i.e., a framework or outline) by which all things can indeed by understood." (Naugle 2002, pp. 77)

A Kierkegaardian take on worldview would suggest that the idea of *the right time,* or *the opportune moment,* is an important notion which suggests that temporality and rhetoric should be taken into account when assessing the strength and vitality of a worldview. This means that we always have to evaluate a worldview in light of the context and the actual challenges. The usefulness of a worldview depends not only on the logical and conceptual properties of the worldview, but mainly on its relevance in the actual situation as a key to a deeper understanding of reality. This is why a Protégé analysis of a worldview can only be partial, although it can certainly be very useful with respect to the aspects it can analyze.

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