# Ontology for Representing Human Needs

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**Abstract.** Need satisfaction plays a fundamental role in human well-being. Hence understanding citizens' needs is crucial for developing a successful social and economic policy. This notwithstanding, the concept of need has not yet found its place in information systems and online tools. Furthermore, assessing needs itself remains a labor-intensive, mostly offline activity, where only a limited support by computational tools is available. In this paper, we make the first step towards employing need management in the design of information systems supporting participation and participatory innovation by proposing OpeNeeD, a family of ontologies for representing human needs data. As a proof of concept, OpeNeeD has been used to represent, enrich and query the results of a needs assessment study in a local citizen community in one of the Vienna districts. The proposed ontology will facilitate such studies and enable the representation of citizens' needs as Linked Data, fostering its co-creation and incentivizing the use of Open Data and services based on it.

**Keywords:** Human Needs Ontology, OpeNeeD, Needs, Satisfiers, Need Studies, Representation, Linked Data

## 1 Introduction

Needs form an essential basis for human well-being [38]. It has been argued that addressing needs is an effective approach to guide organizational change [40], increase employees' well-being [18] and support decision making [34]. No less important is understanding of citizens' needs for developing a successful social and economic policy [6, 7]. Due to the importance of need satisfaction, several need theories have been developed in humanities and social sciences, such as psychology, economics, philosophy, sociology, anthropology and social policy over the last century. However, the concept of need has not yet been fully taken into account in information systems and online tools as it deserves.

Furthermore, because of the existing narrow computational support, needs assessment methodologies themselves have remained labor-intensive, mostly offline activities. Specifically, while only a few methodologies for assessing and systematically studying needs exist to date (e.g. [3, 21]), tasks such as acquisition,

representation, analysis, and visualization of citizens' needs still belong to a largely offline area, in which support by dedicated computational tools is either limited or not existing[3].

The contribution of our paper towards bridging this gap is twofold. Firstly, based on selected publications from the vast body of research studying human needs in various contexts, we develop a modular ontology consisting of a small robust core capturing central theoretical concepts present in most need theories, and a number of extensions reflecting specific need theories and need assessment methodologies. Secondly, we report on a need study experiment performed in a local community in one Viennese district. The ultimate goal of the project was to intensify online participation and narrow the divide between offline and online urban communities through co-creation of citizen-centric Open Data.

We envisage that OpeNeeD will open up the vast body of existing interdisciplinary research for use in the Semantic Web context, encouraging the sharing and analyzing the data about human needs across fields and communities. Done properly, such data can have numerous applications, from strengthening online participation and fueling open science to better decision making at the local level and improved open government processes. Thus, we see open needs datasets as important for both citizens and policy-makers. With numerous need theories underpinning the need data, semantically enriched RDF format is a natural choice for data publishers wishing to facilitate the interpretation and enable re-use of the data.

The paper is organized as follows: in Section 2, we provide a necessary background, namely an overview of relevant need theories (Section 2.1), and a survey of existing relevant ontologies (Section 2.2). In Section 3, we present our family of ontologies for representing human need data. In Section 4, we first present a concrete method for creating and inferring explicit knowledge of needs and then show how the results of a specific study can be represented using OpeNeeD in Section 4.3. Section 5 offers concluding remarks and discusses some further potential positive impacts of the presented ontology.

## 2 Background and Related Work

### 2.1 Theoretical Background

Since need satisfaction is one of the most fundamental aspects of humans, several need theories have been proposed over the last century. Although no consistent usage of the term "need" can be found across or within various disciplines [13], it can be said in many cases the identification and categorizing human needs constitutes the main focus of many studies operating with the term need, thus

[3] Due to differences in researchers' epistemological positions, some researches prefer to use other terms instead of *need assessment*, such as *creating and inferring explicit knowledge of needs* (see e.g. [21]). In this paper, we try to use the term *need assessment* and other similar terms from a neutral perspective, without following or supporting a particular epistemological position.

resulting in numerous alternative systematics. Table 1, summarizes some of the main need categorizations that have been proposed in the literature. As a non-normative supporting tool, the ontology that is presented in this paper, makes it possible for experts to use any need-categorizations that they prefer to represent human need data.

**Table 1.** Over the last century, many categorizations of human needs have been proposed. This table summarizes some of such categorisations.

| **Author** | **Concise summary / categorization** |
|---|---|
| Aristotle [36] | Necessity is closely related to needs. Two types of necessities or needs: 1. Absolute needs, 2. Relative needs. Three types of goods: 1. Goods of the soul, 2. Goods of the body, 3. External goods |
| Murray [33] | Psychogenic needs: 1. Ambition needs, 2. Materialistic needs, 3. Power needs, 4. Status defence needs, 5. Affection needs, 6. Information needs |
| Alderfer [2] | 1. Growth, 2. Relatedness, 3. Existence |
| Kano et al. [23] | 1. Basic needs, 2. Delights, 3. Performance needs |
| Deci and Ryan [8] | Psychological needs: 1. Competence, 2. Relatedness, 3. Autonomy |
| Maslow [28, 29] | 1. Physiological needs, 2. Safety needs, 3.Love needs, 4. Esteem needs, 5. Cognitive needs, 6. Aesthetic needs, 7. Self-actualization, 8. Self-transcendence |
| Max-Neef [31] | A 36 cell matrix of needs; First dimension: 1. Subsistence, 2. Protection, 3. Affection, 4. Understanding, 5. Participation, 6. Leisure, 7. Creation, 8. Identity, 9. Freedom; Second dimension (existential categories): 1. Being (qualities), 2. Having (things), 3. Doing (actions), 4. Interacting (settings) |
| Doyal and Gough [9] | 1. Health needs, 2. Intermediate needs, 3. Autonomous needs |
| Price [35] | Children Needs: 1. Physical, 2. Physiological, 3. Psychological, 4. Social, 5. Emotional, 6. Intellectual, 7. Educational, 8. Spiritual |
| Glasser [14] | 1. Survival (food, clothing, shelter, breathing, personal safety, security and sex, having children), 2. Belonging/connecting/love, 3. Power/significance/competence, 4. Freedom/autonomy, 5. Fun/learning |
| Thomson [39] | Fundamental versus instrumental needs |
| McLeod [32] | Absolute versus relative needs; Universal versus particular needs; Existence versus welfare needs |

Besides categorizations of needs, it has been proposed that needs should be differentiated from desires and satisfiers. While needs are the most fundamental requirements and the basis for one's desires and satisfiers, desires are personal and intentional. Satisfiers are either objects or states in which needs and desires are fulfilled. Figure 1 shows a hierarchy of needs, desires, and satisfiers [19, 21]. Needs, desires, and satisfies have been defined as distinct classes in the OpeNeeD ontology. This is an important difference of OpeNeeD and other few existing

similar approaches that enables many new innovative applications, which will be discussed later.

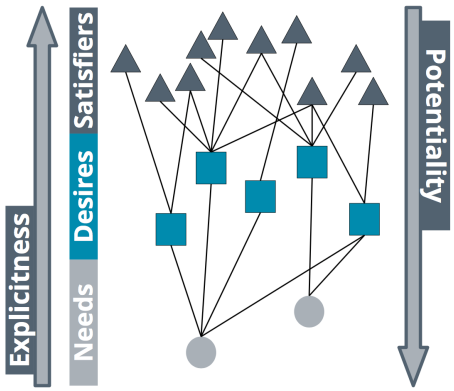


**Fig. 1.** The hierarchy of needs, desires, and satisfiers according to [21]

In addition to general proposed categorizations, a vast sets of adjectives or tags may be used to define needs (and also desires and satisfiers). These adjectives have provided a virtually inexhaustible binary distinctions between different kinds or levels of needs [6]. Table 2 shows some of the most used adjectives and binary distinctions that can be used for defining needs (see [6] for a detailed definition of these adjectives). OpeNeeD makes it possible to assign these adjectives to need entities.

Ontologies in the OpeNeeD family are provided with a set of optional rules in the Semantic Web Rule Language (SWRL) [17] to be used, modified and extended by experts. Our current application of rules is to enable automatic inference of appropriate adjectives based on the provided data. E.g. an expert with a non-constructivist epistemological position can define the following rule: if a need (also a desire or a satisfier) has been declared by a citizen, it can be automatically identified as a *felt* or *subjective* need. Similarly, if a need has been assessed by an expert, it can be automatically marked as *interpreted* or *objective* need. The rules have limited applicability scope and need to be applied with care. For instance, the distinction between felt/subjective and interpreted/objective needs does not hold for constructivist approaches like Bewextra [21]. Based on these perspectives some requirements considered to be needs if they are declared as necessities by the very individual. Although experts (analysts) make claims about them, the final judgment about need or non-need is done by the individuals. Thus, when using OpeNeeD, researchers standing on certain epistemological positions should choose or extend the rules according to their perspective.

Finally, it has been argued that people are not aware of their hidden needs [15] and tend to express their satisfiers when they are asked to declare their needs.

**Table 2.** Some of the most used adjectives and binary distinctions that can be used for defining needs [6]

| |
|---|
| **Some of the adjectives that may be used to define different kinds of needs:** *e.g. absolute + need = absolute need* |
| absolute, basic, circumstantial, common, comparative, derivative, discursive, experiential, expressed, false, felt, higher, inherent, instrumental, intermediate, interpreted, normative, objective, ontological, particular, real, relative, social, subjective, substantive, technical, thick, thin, true, universal |
| **Some of the binary distinctions between different kinds or levels of human need:** |
| absolute ⇔ relative \| objective ⇔ subjective \| basic ⇔ higher \| material ⇔ non-material \| positive ⇔ negative \| non-instrumental ⇔ instrumental \| non-derivative ⇔ derivative \| physical/somatic ⇔ mental/spiritual \| physiological ⇔ cultural \| viscerogenic ⇔ sociogenic \| intrinsic ⇔ procedural \| natural ⇔ artificial \| true ⇔ false \| inherent ⇔ interpreted \| constitutional ⇔ circumstantial \| thin ⇔ thick \| hedonic ⇔ eudaimonic |

Hence, need assessment is not an easy and straightforward task [3,21]. Accordingly such studies normally include different steps of interpretation and evaluation (see section 4 for an example of such studies). Therefore, it is very important to be able to keep track of the source of an information and to know whether it is a citizen's direct declaration or an expert's interpretation based on a particular method in a particular step of a need assessment study. The OpeNeeD ontology, that is presented in this paper, makes such kind of source-tracking possible.

### 2.2 The Concept of Need in the Semantic Web Context

The hypothesis that explication of needs as a driving force of human activity can bring positive impact on the economy has been articulated by [42]. There are several projects (mostly in the research or prototype phase) that bring this concept in the Semantic Web context and even make it a cornerstone block of large architectures. One of the most notable examples of this is the project *Web of Needs* [24, 25] that seeks to build a distributed social network where matchings between human participants are established automatically based on the needs they publish or want to help satisfy [12, 26]. The Web of Needs consists of agents (nodes), who exchange semantic information, which is captured in the RDF format [26]. The ontology used in the system [4] is rather operational, with the focus on matching users based on needs they publish or intend to fulfill, and enabling the software agents to communicate in order to enabling the matching process. In fact, the ontology does not distinguish between needs and satisfiers and is insufficient to describe studies of needs.

[4] http://purl.org/webofneeds/model

An approach with a similar scope to ours is described in the Master's thesis by S. Dsouza [10] developing the Fundamental Human Needs Ontology (FHN) which does distinguish between satisfiers and needs, it also distinguishes particular needs identified by Max-Neef [30] including *affection, creation, freedom, identity, leisure, participation, protection, subsistence* and *understanding*. The ontology itself is described in the thesis but unfortunately not currently available in a machine readable form. As can be inferred from the description, FHN lacks means of describing both the *provenance* of needs (e.g., how these needs have been obtained) and their assessments and evaluations, which is crucial for applications. The ontology [10] is evaluated using a prototype mobile application by the ontology author rather than any study with human subjects.

As indirectly follows from the recent survey [1], there are to the best of our knowledge no other attempts to formalize the concept of human need along the lines of literature sources mentioned in Section 2.1. It follows that an ontology capable of representing human needs resulting from some principled assessment methods hardly exist yet. We address this shortcoming with the OpeNeeD ontology described in the next section.

## 3 The OpeNeeD Ontology

This section presents OpeNeeD, a modular OWL ontology for publishing human need profiles. The following general requirements motivate the design of the ontology:

(i) The ontology must be modular, allowing for expressing relations between different need theories while allowing to capture the semantics of needs, desires (wants, wishes) and satisfiers in different approaches.

(ii) It should capture the categorizations and adjectives commonly used to describe and specify needs, desires and satisfiers (see Section 2.1 for a sample of such common categorizations and adjectives).

(iii) It should support principled rigorous studies, like Bewextra (see Section 4.1). It should be possible to clearly identify the input data created by the study participants, along with the relevant context information in which the data has been obtained.

(iv) It should be possible to track the lineage of measurements associated with the derived concepts, including the input data used, and the methodology underpinning the computation.

(v) The ontology must allow for (and possibly encourage) publishing of the input data and intermediate steps, to facilitate verification and reuse of the raw collected material.

As demonstrated by Fig. 2, besides the core need theory concepts (subclasses of HumanRequirement in Fig. 2), the focus of OpeNeeD-Core ontology is on specifying the context of the study, in particular experts performing the study, community of study participants (human subjects), methodology used,

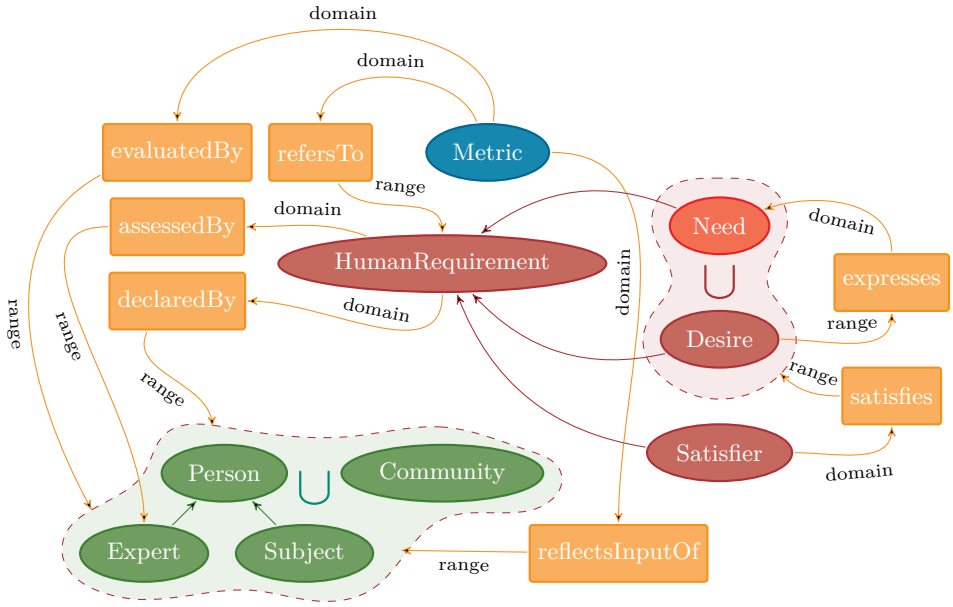


**Fig. 2.** An outline of the OpeNeeD-Core ontology

identified human requirements: satisfiers, desires and needs, and metrics assessing of identified requirements.

The following external ontologies are referenced by OpeNeeD-Core (Table 3) using the owl:imports instruction.

**Table 3.** External ontologies used in the TBox of OpeNeeD-Core

| OpeNeeD concept | Equivalent external concept | Reference |
|---|---|---|
| Person | http://www.w3.org/2006/vcard/ns#Individual | [16] |
| Metric | http://purl.obolibrary.org/obo/IAO_0000027 | [4] |

While no consistent usage of the terms and concepts can be found across various need theories [13], we tried to make OpeNeeD-Core as lightweight and robust as possible. Hence, it only includes basic classes and properties that commonly occur in need theories. Considering that it is not obligatory to use all classes (e.g. *Desire*) and properties of the OpeNeeD-Core ontology, researchers are free to apply the ontology based on their own interpretation. To enable concrete applications, OpeNeeD-Core can be extended by a number of further ontologies as depicted in Fig. 3: OpeNeeD-Adjectives, an ontology for representing needs adjectives and binary distinctions between different kinds or levels of human needs (see table 2), OpeNeeD-Maslow, an ontology for representing Maslow's hierarchy of human needs (see table 1), OpeNeeD-Max-

Neef an ontology for representing Max-Neef's classification of human needs (see table 1), and OpeNeeD-Bewextra, an ontology for representing human need data derived by the Bewextra needs assessment methodology (see section 4.1). We plan to extend the range of formalized theories in the course of future work. As it was mentioned before, experts can develop their own external ontologies and connect them to the OpeNeeD-Core. Figure 3 illustrates the current structure of the OpeNeeD family and specifies the URLs under which the respective ontologies can be accessed.

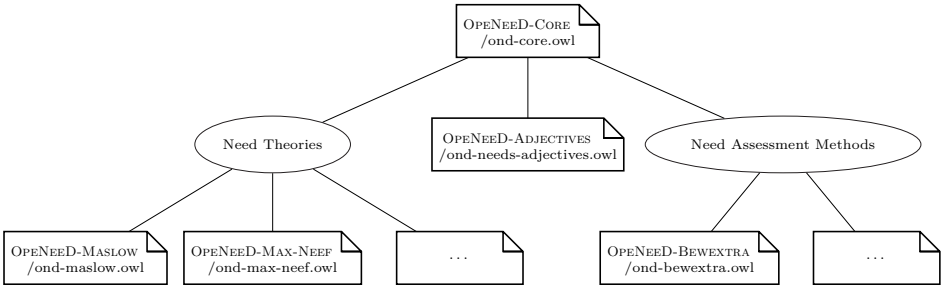


**Fig. 3.** OpeNeeD ontology family, available at `http://purl.org/openeed`

## 4 A Use Case for OpeNeeD

We have applied the OpeNeeD ontology to create an open dataset capturing the need profile of a local community in one of Viennese districts (Stuwerviertel, part of the second district of Vienna, also known as Leopoldstadt). In this section, we provide an outline of the need study and the underlying methodology used to perform it.

### 4.1 Bewextra: A Method for Investigation of Needs

Among a few other methods to identify needs (e.g. [3,15]), Bewextra is an action research approach to investigate substantial needs of people. This methodology aims at creating need knowledge in social systems that should inform and enhance decision making [19, 21, 22]. The approach is radically bottom-up which means that it starts with the perspective of the very individual and tries to find common patterns among the members of the social system. It uses qualitative methods for data acquisition and has been applied in organizational learning projects with up to 300 participants [20].

The methodological framework consists of three consecutive steps. The first step covers data acquisition based on the approach of learning from the future. The output of this step is a number of satisfiers, articulated by the members of an organization in a process where facilitators ask questions about an ideal future

scenario. In the second step, analysts propose hypotheses about substantial needs underlying the satisfiers, stimulated by the observations of the first step and enabled by different views on these observations. Finally, the third step covers the validation of the generated hypotheses by communicative validation and quantitative analysis. In the following, we describe the three steps in more detail. Figure 4 shows the whole Bewextra framework at a glance.

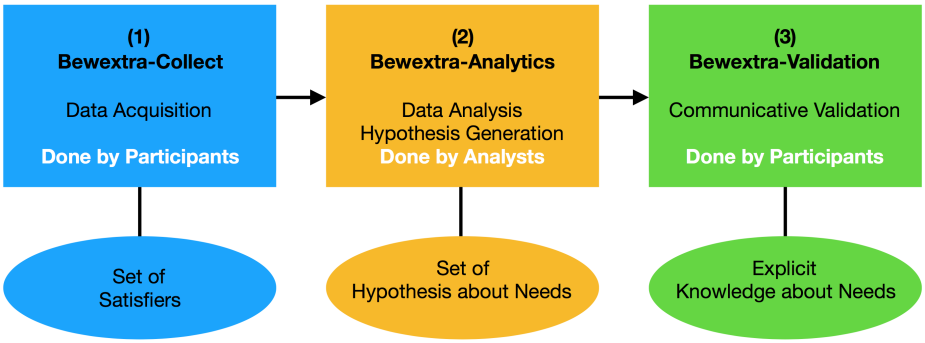


**Fig. 4.** Overview of the Bewextra process

**Bewextra-Collect** The purpose of the first step is to create a trustful workshop environment that enables the participants to explicate a large number of wishes, dreams, visions and ideas of an ideal future (in the context of their social system). The workshop interventions are designed to facilitate the detachment from the current situation in a way that participants can fantasize about their ideal future scenarios. A facilitator makes the participants imagine that they were actually present in a scenario taking place in the future (5 to 10 years from now); the narrative time journey takes up to several minutes and the imagined time leap is illustrated with appropriate music. Whilst being engaged in these scenarios, the participants are asked to answer two questions: "What has emerged and is new?" and "What has come to an end?". In this setting, people should shift their thinking, i.e. to detach from today's circumstances, including restrictions and impossibilities and to come up with visionary and creative results transcending current boundaries. Following the Stakeholder Theory [11], we involve all stakeholder groups concerned, i.e. learn from the future from different points of view. This allows for investigating the overall social system holistically.

**Bewextra-Analytic** For the data analysis and the generation of hypotheses about needs we follow a hermeneutic approach [5] and use generative listening [37, 41]. The method of generative listening aims at hearing the essence of what the participants say and thus, trying to hermeneutically understand which need(s) they try to express by the satisfier they mention. It is about capturing the essence

by not letting prejudice take over, trying to see the world with the eyes of the participant.

Using the method of generative listening on the satisfiers which were generated in step-1, we are coding the articulated ideas, wishes and answers. For this purpose, we regularly use the software suite ATLAS.ti to organize codes (and groundedness) and to illustrate hierarchies. The unit of the analysis (defined as a quotation in ATLAS.ti) is each participant. Finally, we utilize a haptic approach and put the codes (often several hundreds) on the floor. We then organize and cluster them so that patterns emerge and main categories of hypotheses about possible hidden needs can be generated. In short, Bewextra-Analytic enables the emergence of hidden needs of the participants and results in a set of hypotheses about needs.

**Bewextra-Validation** In the final step, the set of need hypotheses generated during Bewextra-Analytic is validated. The hypotheses shall be validated in terms of both correctness and completeness. For the validation of correctness we use an online questionnaire containing the hypotheses generated in Bewextra-Analytic. This questionnaire is sent to all participants and consists mainly of Likert scale questions. Each need hypothesis can be rated from 1 to 4, where 1 means that the hypothesis does not fit at all and 4 means that the hypothesis fits perfectly. Additionally, the participants are asked to comment on the completeness of the proposed need hypotheses in case that relevant needs or need aspects are missing. This communicative validation can either be done in a workshop setting or as part of the online questionnaire. The simultaneous use of completeness (qualitative) and correctness (quantitative) validation allows us to accept or reject the generated hypotheses about needs in order to finally create a catalogue containing explicit knowledge about substantial needs.

### 4.2 Needs Assessment for a Viennese Quarter

Originally conceived as a means of inferring implicit need knowledg in organizations, the Bewextra method has been applied successfully by public administrations, for instance to define the urban development strategy in the German city of Andernach [5]. Here, we outline a results of another recent study in an urban context, specifically a study of the residents' needs of a Viennese quarter *Stuwerviertel*, belonging to a city's second district Leopoldstadt [27]. The context of the study was to explore the means of incentivising online particpation of a currently mostly offline local community.

To this end, the finding of the need study will be used as an input for online discussion towards establishing a development agenda of the quarter. A needs ontology derived from the study using OpeNeeD will furthermore exemplify co-creation in the Open Data context. Below, we sum up the results of the study and then in Section 4.3, we show how these results can be represented with the help of OpeNeeD.

[5] "Leitbild Andernach 2030" http://www.andernach.de/de/leben_in_andernach/leitbildstadt.html

**Data Acquisition and Process** In the first Bewextra-Collect part, 1503 satisfiers from 80 participants in three workshops have been collected. This was achieved by "learning from an envisioned future" [21]: the workshop participants tried to imagine themselves in the year 2030 and provided a short account of their wishes, dreams, thoughts that came to their minds during the thought experiment. The subsequent data analysis step based on a method called *generative listening*, resulted in 355 codes — hypotheses about underlying needs of this large number of satisfiers (see table 4).

**Table 4.** Overview of the phases Bewextra-Collect and Bewextra-Analytic

| **Workshop** | **Participants** | **Satisfier** | **Codes** | **Needs** |
|---|---|---|---|---|
| **School 1** | 39 | 599 | 156 | |
| **School 2** | 27 | 581 | 135 | |
| **Adult Residents** | 14 | 323 | 64 | |
| **Sum** | **80** | **1503** | **355** | **12** |

**Table 5.** Identified needs and their acceptance rate by 122 survey participants

| **Need for** | **Acceptance Rate** |
|---|---|
| opportunities to spend spare and leisure-time | 85% |
| cleanliness | 84% |
| local supply | 83% |
| security | 81% |
| education | 80% |
| aesthetics and beauty | 79% |
| good human relations | 79% |
| modernity and continuous development | 77% |
| opportunities to meet and feel connected | 77% |
| a supportive political frame | 77% |
| positive recognition of the district | 76% |
| highly ecologically compatible mobility | 76% |

In the Bewextra-Analytic phase a catalogue of 12 hypotheses about shared and contextualized needs in the quarter has been produced via *semantic clustering* performed by several experts. These hypothesized needs were then validated via communicative validation by a subset of individuals living, working, and going to school in the respective local area (122 online survey participants). The acceptance rate reflects the degree to which participants of the survey share the identified needs on a four point scale ranging from "I agree" and "I rather agree" to "I rather not agree" and "I do not agree". The results of the study can be found in Table 5, and their OpeNeeD encoding is discussed next.

### 4.3 Representing Study Results in OpeNeeD

To capture the result of a study outlined in the previous section, we instantiated the classes of the OpeNeeD-Core and OpeNeeD-Bewextra ontologies. In particular, from the latter one, the community approval metric, a subclass of ond:Metric (or, equivalently, of OBI_0000027 "data item" of [4], with the class ond:CommunityApproval defined in OpeNeeD-Bewextra (since community approval is part of Bewextra methodology but not necessarily relevant for other theories and methods). An excerpt of the ontology instance representing a row from Table 5 is graphically depicted in Fig. 5.

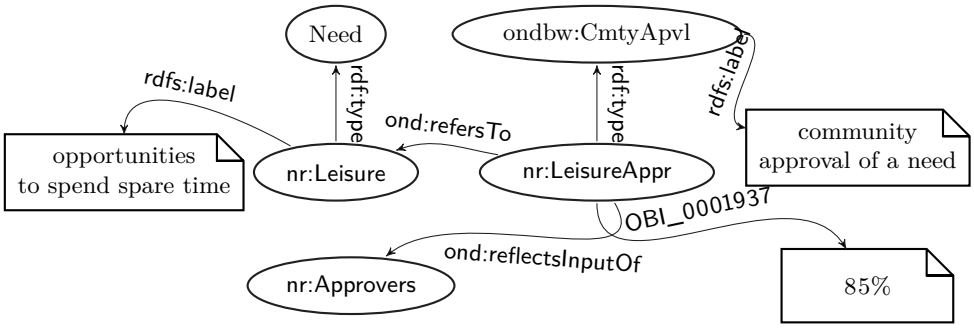


**Fig. 5.** Example of the instance data in OpeNeeD

With more than thousand random satisfiers mentioned by the participants of the experiment, we do not instantiate them all in the ontology. Raw data remains available in an accompanying datasets as questionnaire scans. Extracted are selected *codes* (created during the workshop for adult residents – cf. Table 4) which in OpeNeeD terminology correspond to *desires*, and the *needs*. We believe that such a flexibility of reflecting the raw data in the ontology is desirable, and designed OpeNeeD with a possibility of describing the origin of satisfiers, desires and needs as individuals (class odn:Subject) or community as a whole (class odn:Community). This allows to publish the data with varying degrees of granularity, as permitted by resources.

### 4.4 Expected applications of the ontology

The OpeNeeD ontology introduced in Section 3 has many potential applications. Firstly, it serves for publishing the results of studies as a self-contained dataset, for instance as Open Data. Secondly, it facilitates querying the results of a single or multiple studies thus enabling comparative analysis. For instance, satisfiers mentioned by the study participants within the Bewextra-Collect phase can be analyzed according to common social science criteria such as age or gender. Regarding age, it is typically desirable to distinguish between the needs of

adolescents and elderly, in order to specify policy interventions. Queries would allow for drawing a connection between satisfiers and needs, enabling one, e.g., to identify most representative needs. Thirdly, it enables data enrichment, e.g., using SWRL rules as described in Section 2.1. Fourthly, the design of OpeNeeD encourages tracking provenance of declarations, assessments, and evaluations, be it individual experts who assess needs, user communities who declare or evaluate them, or any other person or entity. Last but not least, the modular structure of OpeNeeD allows both the requirements of larger communities, as well as of subcommunities and even individuals within them, to be represented. It is a matter of available resources if the results of need studies are captured with a high degree of granularity. Investing effort into preserving the inputs and requirements of as small groups as possible is a way towards embracing pluralism and properly reflecting the needs of minorities even if these are not preserved in an aggregated assessment.

## 5 Conclusion and Outlook

In this paper, we presented OpeNeeD, a family of ontologies for representing human need data. As a non-normative support tool, the ontology can be used to create human need profiles derived based on different epistemological or methodological standpoints. Hence, it consists of a small core ontology and an extendable collection of ontologies covering specific need theories and methodologies.

As an evaluation, we used OpeNeeD to represent, enrich and query the results of a recent needs assessment study. This allowed us to convert the identified need profiles of the local community into a Linked Open Dataset, making the results of the needs assessment study available for citizens, policy makers and researchers. At the same time, equipped with the ontology and semantic representation of the study results, one can query, compare, enrich, analyze, evaluate and archive the data obtained in the past, current and future studies, helping to scale up needs assessment methods and broaden the range of their applications.

Beyond the presented use case, OpeNeeD will facilitate declaration, assessment, processing, representation and visualization of individual citizens' needs or communities' collective needs. Clearly, not all such data can be openly published: individual or sensitive needs should be only processed while fully respecting citizens' privacy and security. In particular, (i) in personal use cases, such data can be processed by private secure artificial agents, who are under the control of the individual citizens (data owners); (ii) in public use cases, such data can be used as anonymized or pseudonymized information by the permission of the individual citizens. A detailed discussion of these concerns falls outside the scope of this paper. We believe that creation of people's need profiles, when done correctly, can have wide-reaching applications, e.g., supporting citizen participation, direct democracy, open government, open science, and ultimately pluralism in the society.

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