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Author(s): Tuomela, S., & Juntunen, J. K.

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Collectivist and Individualist End-user Values in the Digital Energy Community Ecosystem

Sanna Tuomela

School of Technology and
Innovations
University of Vaasa
Vaasa, Finland
sanna.tuomela@uwasa.fi,

Center for Wireless
Communications
University of Oulu
Oulu, Finland
sanna.tuomela@oulu.fi

Jouni K. Juntunen

School of Technology and Innovations
University of Vaasa
Vaasa, Finland
jouni.juntunen@uwasa.fi

Energy community (EC) is an emerging entity in the energy system. EC information system enables energy consumers and prosumers collectively generate, use, share and trade renewable energy, as well as communicate and exchange data and information within the EC and with external stakeholders. End-user values collectivism and individualism are strongly related to the participation in the energy community through the information system. Collectivistic and individualistic value categories were elicited in 96 value-focused interviews with energy consumers and prosumers as potential energy community members. Although these value categories are partly conflicting, they disclose shared goals that may be implemented in the EC information system.

Keywords—energy community; user values; digital platform

I. INTRODUCTION

Energy community (EC) is a new entity in the energy system, referring to a group of individuals, businesses, or organizations that collaborate to produce, consume, or manage energy resources collectively [1]. ECs are set to engage energy consumers, businesses and communities in the triple energy, digital and social transition [2], [3], and to advance a more sustainable energy future collaboratively [4], with the use, generation, sharing and trading clean energy [5]. The energy system is transforming from a centralized energy generation and one-way energy transfer to a increasingly decentralized, distributed and complex consequently setting high demands for the energy management [6]. Digital technologies and data exchange hold an extensive potential to forecast and match energy supply and demand, thereby cutting costs, improving energy efficiency and resilience, and reducing emissions [2]. Digital platforms and solutions may enable inclusive, transparent and sustainable participation in ECs [6]. In the design of digital applications for ECs the social dimension needs special attention [7]. ECs are expected to empower energy consumers and prosumers and provide them with more information and awareness on clean energy use and generation and offer new means to participate in the energy markets [8]. End-users and other EC stakeholders have diverse values and goals, that may either foster or hinder participation in the ECs [9]. However, end-users' perspective on EC digital tools is poorly understood. This paper presents a value-focused study on individualistic and collectivistic values in the context of the

EC. These values emerged in the interviews of 96 energy consumers and prosumers. The research questions are

- 1) How are individualist and collectivist values expressed regarding the EC?
- 2) Are individualist and collectivist conflicting values in the context of the EC?
- 3) How these values are to be addressed in the EC and in digital EC platforms?

II. DIGITAL ENERGY COMMUNITY PLATFORMS AND END-USER VALUES

ECs are expected to take a key role in the transformation of the whole energy system and the energy market [10]. However, in the current emerging state of the EC scene there is a lack of information systems for the EC. Though digitalization is seen as an essential element in the pathway to successful ECs [11], [12], currently the digital platforms and tools used for the EC operation and communication between actors are partial solutions that are taken into use ad-hoc, and that are not designed specifically for ECs. EC information system that is based on the end-user needs fosters participation in the EC and adoption of EC related digital tools. As shown in the figure 1, information systems for ECs connect energy community ecosystem actors and data for planning, monitoring, control and communication for the optimal operation of the energy community. Energy community information system enables efficient collaboration between actors on accumulating and sharing knowledge, the use of data, and optimization of energy

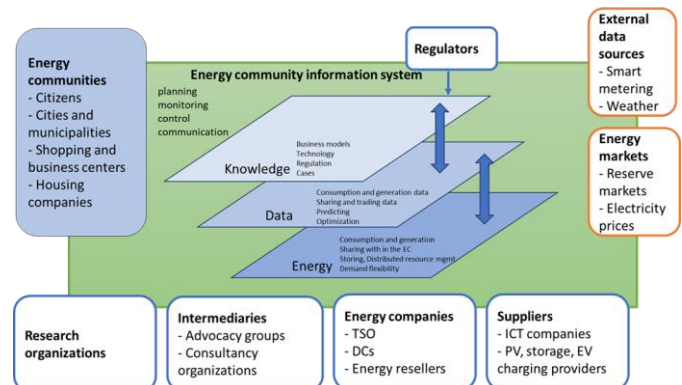


Fig. 1. Energy community information system.

generation, consumption, sharing and trading. There are diverse interfaces for each user group and data type.

In value-focused technology research end-user values are defined as internal perceptions of what is important in a certain usage context, and on the other hand as “value for the user”, which the technology provides the user within the interaction with the technology [13]. Usually, ECs adopt collaborative principles and mechanisms to facilitate the production, sale, and sharing of renewable energy within the digital energy ecosystem [14]. The role of collaboration in the ECs is essential also with other stakeholders who often have a technical, financial, research or governmental role in the EC. Values guide people in their choices and actions, thus values among other socio-cultural factors impact on how willing people are to join an EC and participate EC activities through an energy information system, but values are also affected by the design and use of technology [15], [16]. Collectivism refers to “a social pattern consisting of closely linked individuals who see themselves as parts of one or more collectives [...] and who are primarily motivated by the norms of and duties imposed by those collectives; are willing to give priority to the goals of these collectives over their own personal goals” [17], whereas “individualism is a social pattern that consists of loosely linked individuals who view themselves as independent of collectives, are primarily motivated by their own preferences, needs, rights and the contracts they have established with others and give priority to their own goals over the goals of others”.

III. METHODS AND MATERIALS

This research draws from the social-informatics approach, that is directed towards impacting the technology and social use context in a way that takes the user needs, social practices and relevant stakeholders in to account [18], and is inspired by the value-sensitive design framework, that is a widely known and utilized user-centered design approach, which aims proactively to consider human values throughout the process of technology design [19]. Socio-informatics theory deals with the design of digital solutions with respect to their interaction with the social practices of their users [18] and considers digital solutions as “the outcome from negotiations of various asymmetries of power and knowledge, and of different sets of values” [20]. The complex research question of values of individualism and collectivism in the EC required in-depth interviews with potential members of an EC. Interviews on values in the context of the EC were conducted by phone during the spring and summer in 2022. The interviewees volunteered to be interviewed and left their contact information in a previously conducted online survey concerning ECs. Of the 96 interviewees 10 were women, and two thirds (60) were prosumers, i.e., had solar panels for microgeneration of energy. The values were elicited with the laddering interview technique [21] i.e. by first prompting with questions about concrete attributes of EC information system, then asking about expected consequences and finally values. Interviews were transcribed and analyzed applying thematic analysis [22], [23]. Individualistic and collectivistic values emerged remarkably in the thematic analysis showing a strong

effect of these values on the participation in the EC and the use of the digital EC application.

IV. FINDINGS

In the interviews of 96 consumers and prosumers interested in the EC, many common and on the other hand conflicting values emerged. All interviewees expressed either individualistic (53) or collectivistic (67) comments, or both (24) for justifying why EC would/would not be interesting/useful/feasible in their situation. The end-user motives and goals in the context of the EC were worded in different ways either from the individualist or collectivist perspective. Collectivist values were interpreted from the comments that referred to collaboration, reaching common goals together with others, and seeing the community stronger than an individual in building capacity for RE generation and investments, in sharing and trading energy within in the EC and in participating in the energy markets and in collaborative learning. Conversely, individualist values emphasized household’s own energy generation, e.g. solar panels, and optimization of own energy generation in the household’s own consumption.

A. Collectivist and individual values for the participation in the EC

As presented in figure 2 the most important collectivist value equally for prosumers and consumers (i.e. non-prosumers) was that they felt in the EC they would be stronger together with others in the energy markets, and they would be able to have an impact on the energy transition. Many interviewees expressed strong distrust towards incumbents.

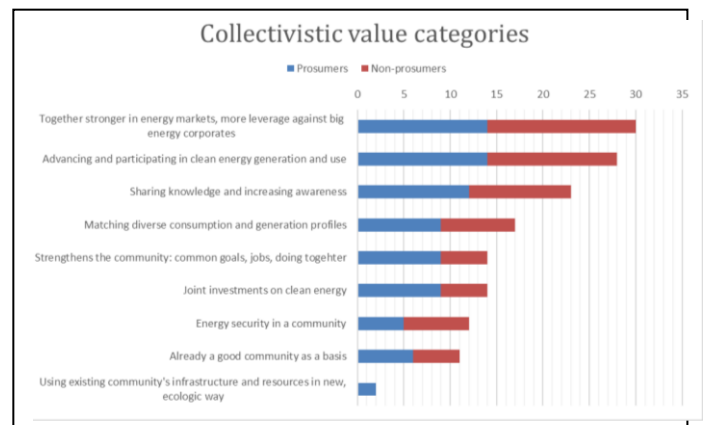


Fig. 2. Collectivist values for the participation in the EC.

The second most often mentioned collectivist value was to be able to advance and participate in clean energy generation and use. For a quarter of interviewees sharing knowledge and increase awareness on RE generation, sharing and trading and on possibilities opened with an EC was important. All these values were shared almost equally by prosumers and consumers. Consumers valued slightly less than prosumers optimization by matching generation and consumption within the EC, and the role of the EC in strengthening the community. Only 10-15 % of interviewees raised the values of possibility to invest together in clean energy, energy security or using the

existing community as a basis for the EC. Only few prosumers visioned the use of existing infrastructure, e.g., electric vehicle (EV) charging and batteries for the EC.

Figure 3 on individualist value categories shows a quarter of interviewees expressed individualism in terms of prioritizing own energy generation, consumption and optimization, especially among prosumers. Since consumers do not have own energy generation, they did not emphasize this value. One of six interviewees thought their community or themselves do not have resources, either economic, infrastructure or a functionable social structure that would be required for an EC. Every seventh interviewee did not believe that participation in the EC would benefit them in any way. Some preferred individual rather than shared responsibility on energy generation, consumption, sharing and trading, and eight interviewees outright stated there will arguments and complications when collaborating in the EC, therefore they would like to have their own energy generation, optimization and participation in the energy markets without a community. Community as a term had historical or political connotations for some respondents. Independency from others and securing own households energy flow was valued by a few interviewees. Understandably this was a value category mentioned mostly by prosumers who by definition own energy micro-generation, therefore they have already taken action in securing their own energy supply.

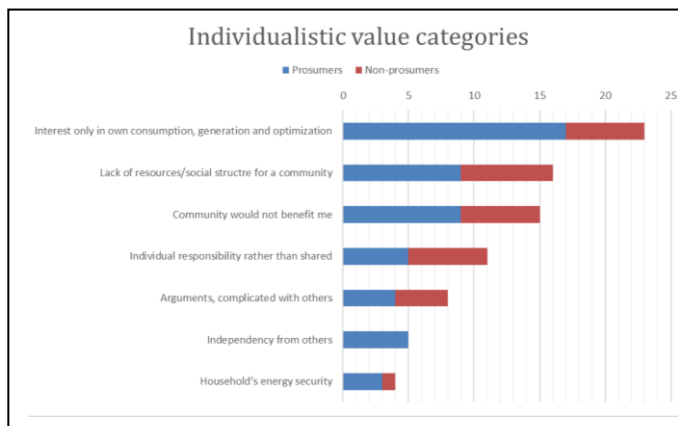


Fig. 3. Individualistic value categories of potential EC members.

The identified value categories and quotations indicate that trust is strongly related to both values – self-confidence, lack of trust for other members, other EC ecosystem actors or technologies emphasized individualistic values, whereas trust towards other people, technologies and information strengthens collectivistic value propositions. Individualistic and collectivistic values are expressed in terms of trust towards others. The carriers of collectivistic values believed that together with others it is easier, smarter and more profitable to join forces and invest and build together RE energy generation, e.g., share private solar panel generation in a community, invest together in a co-operative RE generation, optimize RE generation and demand flexibility between

different consumption profiles. Individualistic values were expressed in terms of self-reliance, independence from other people and ‘owning’ the RE generation and optimization. Interestingly, when the data on the collectivistic and individualistic value categories is set side by side, it became evident many end user values can be expressed in both collectivistic or individualistic terms. EC end-users have largely similar goals, yet paths and means to reach the goals differ. In figure 3 the collectivistic and individualistic values are linked to identified shared goals in the EC. The shared goals are knowledge, promoting clean energy, economic gains, energy security and privacy. The role of community in clean energy generation and use was seen from different perspectives in reaching these goals. For example, desired knowledge may be sought through sharing and accumulating knowledge in a group, though lack of knowledge may also hinder participation. On the other hand, some potential EC members want to keep their information on energy generation and consumption private or prefer to gain more knowledge for their own energy optimization. All interviewees value promoting clean energy generation and use, whether in a community or alone. When it comes to economic gains, some thought they would have a better leverage on energy markets in a group, while the others consider there benefit more in the energy markets as a private prosumer. Energy security is important for consumers and prosumers carrying collectivistic or individualistic values, however some thought a community would provide with more energy security for the members, when others saw independency from others adding to energy security.

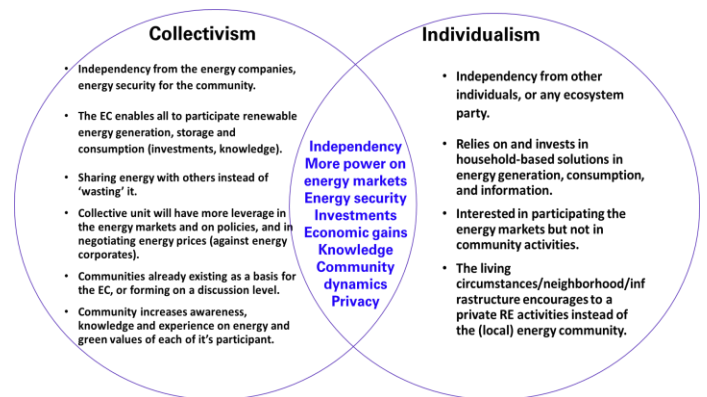


Fig. 4. Shared goals of the collectivist and individualist values in the context of the EC information system.

These identified and to some extent conflicting values, yet mostly shared goals are to be accounted for and implemented in the concept and design of the EC information system in order to engage diverse members in the use and active participation. The focus should be on providing all members of the EC with the means to achieve the goals yet offer diverse paths with options. Also, the members should be able to join an EC and use the digital tools without social dimension, since not all of them seek or value the sense of living community in the context of energy generation, use and trading.

V. DISCUSSION

ECs are expected to provide energy consumers and prosumers possibility to take an active role in participating the energy transition and in the energy market [10]. However, the results of this research illustrate a heterogenous group of potential end-users of EC information system. End-users express diverse values, and especially collectivistic and individualistic values may carry a significant weight on their decision to either join or not to join an EC. Ignoring value conflicts in the planning of the EC and the information system that enables participation may lead to segregation and exclusion of end-users with either individualistic or collectivistic values. Yet, end-users with these partly conflicting values have shared goals. Implementation of these goals in the EC information systems encourages potential end-users with both individualistic and collectivistic values, whether energy consumers or prosumers, to participate in the EC. The system should allow diverse levels of collectivism – individualism for the end-users with features like knowledge sharing, interaction with other EC members and other stakeholders, and collectivist responsibilities and duties. An EC that helps end-users to realize the shared goals: independency, leverage on energy markets, energy security, enable investments in RE, economic gains, knowledge sharing and privacy, attracts users with different values. Emphasis on participatory processes and community capacity (e.g., [23]) may lead to exclusion of people with strong individualistic values and reluctance to identify themselves as part of a community initiative. Based on the collectivistic and individualistic values identified in this research, the EC information system framework (figure 1.) can be used to further identify the values of other stakeholders, and potential value conflicts.

VI. CONCLUSION

This study is the first step towards enhancing our understanding of the end-user values regarding the EC highlighting the partially conflicting collectivistic and individualistic values of energy consumers and prosumers. Individualistic value prioritization may either foster or hinder people for the participation in the EC, depending how they see the benefits of EC for themselves. People with an emphasis on collectivistic values believe an EC may provide them with more than if they were acting individually. However, the values are related to shared goals of independency, leverage in the energy markets, energy security, investing in RE generation and using clean energy, economic gains, increasing knowledge and awareness, position to community activities and privacy. These goals are to be implemented in the EC information system, and attention should be paid to diverse and conflicting values instead of relying on simplistic views of the EC either as a mere economic for-profit entity, or as a collaborative community initiative for the social and environmental benefits.

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