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Energy resource centres (ERCs) as vehicles for extracting higher benefits from solar power in rural and suburban areas of developing countries (the case of Uganda)

Introduction

The very low access to energy in African countries, where over 70% of the population still live in the dark, is significantly hindering development (World Bank, 2019).¹ While some progress has been made in recent years to improve access to traditional on-grid and new off-grid systems, the rate of change is low. The problem is particularly evident in rural and suburban areas where over 80% of the population are resident.

A major barrier is that the understanding of the use of solar power systems has been left to the start-up companies that offer the systems. In most cases, these companies are located far from the rural areas. Consequently, they are not well positioned to systematically investigate solar usage patterns of their customers. The loophole in turn weakens the capability of these firms to develop suitable training and effective customer care services (Amankwah-Amoah, 2015). It has further hindered the capability of these firms to develop products and services that are more strongly adapted to local needs. The potential for value-added use not only in homes, but also for farming, entrepreneurship and broader income-generating activities, has hence remained largely unexploited. Key economic activity like farming and rural/suburban entrepreneurship has as a result not benefited from solar power to the extent that would have been needed to accelerate development.

The study therefore conceptualises and tests Energy Resource Centres (ERCs) as a new tool to fill this usage enablement gap. It does this by involving key stakeholders, especially end users, energy start-ups and supporting institutions in developing ERCs and piloting their use. The tool will be further used to carry out research, deliver training and support firms and users in multiple other ways concerning solar power. These ERCs are a new innovation that will help us to study the use of solar power at a micro level and also support efforts to increase the value of use. Outputs from the ERCs are expected to significantly strengthen ongoing efforts to address extreme poverty and to improve the quality of life in developing country contexts.

The study is guided by the following indicative research question, aim and objectives.

Working research question: How can Energy Resource Centres (ERCs) in developing countries be designed and deployed as vehicles to support more productive and higher value use of solar power?

Aim and objectives: The key aim is to develop an evidence-based understanding of how ERCs can become tools for enhanced socio-economic change in rural and suburban areas, by pursuing the following specific objectives:

- To develop a research-based collaboration with university institutions in participating countries to examine and test ERCs²

¹ World Bank (2019). <https://data.worldbank.org/indicator/eg.elc.accs.zs> [Accessed: 14.05.2019]

² An emerging partnership between The Open University and Makerere University in Uganda has served to pilot the study. Other countries that will be targeted later, in a multi-country study, will be Kenya, Rwanda, S Sudan, Ghana and Nigeria

- To develop partnerships with energy policy/regulatory institutions and solar power companies that can support ERCs³
- To position ERCs in such a way that ecosystems develop around them to support interconnected usage
- To link ERCs to existing initiatives meant to strengthen solar power use in rural and suburban areas
- To contribute to research-based understanding about emerging use of solar power to inform development interventions

Theory context

Our theory-based understanding and explanation of the emerging use of solar power, and renewable energy generally, in developing countries is still limited. While some work is emerging to examine dynamic capabilities (e.g. Dixon et al., 2014; Li and Liu, 2014; Teece, 2007) that enable energy companies to succeed in institutionally fragile contexts (Mbalyohere et al., 2017), the focus of attention has been the firms themselves and not the end users and their community-wide needs. There is therefore a gap in understanding how these dynamic capabilities can be more effectively linked to interventions at the grassroots of communities in developing countries. Consequently, the gap also entails a need to examine and, in turn, support direct innovation in the contexts of the end users. Such an understanding can further inform the firms to develop improved products and services to enable stronger extraction of value by the users. Ultimately, the findings would be expected to inform improved theorisation about developing markets and the patterns of energy use that they are experiencing. Bringing in an ecosystem perspective further strengthens the possibility to spread out the impact of ERCs and to understand wider dynamics of emerging change (e.g. Rong et al., 2015).

Another supporting theoretical perspective is institutional theory, building on interpretations of it that attempt to address the singularities of emerging and developing market contexts. A key observation here is that such contexts are often characterised by a heavy presence of informal institutions that dynamically interact with the more formal institutions. In fact, such informal institutions often substitute formal ones (Helme & Levitisky, 2004). This dynamic manifestation would be expected to exert some influence on ERCs and how they best function, especially in rural and suburban locations where the need is strongest. They could specifically be expected to shape the way dynamic capabilities at various levels find expression.

Methodology

An exploratory approach using qualitative methods (focus groups, semi-structured interviews and non-participant observations) is applied. The design is informed by researchers like Eisenhardt (1989). It foresees multiple semi-structured interviews and focus group discussions with carefully selected participants. It is further informed by the piloting of four ERCs spread across the pilot country. Archives at the various participating policy/regulatory institutions and other organisations will constitute an additional source of secondary data. Finally, a directly administered survey instrument is used to gather more quantitative data. The data – both qualitative and quantitative, was gathered by a group

³ In addition to Makerere University, at least two solar power companies involved in a just ended small study have expressed interest to participate in a wider study. The new funding provides a basis to engage them.

of 12 research assistants who underwent training at a preparatory workshop at the partnering institution in Uganda prior to being dispatched to various parts of the country.

At a later stage and with more funding, a multi-country survey to gather more generalizable evidence for the wider African region will be developed and administered.

Using research ethical principles in the social sciences, permission is sought from participants to record the interviews and anonymously use the transcriptions.

Findings

Semi-structured interviews were conducted amongst firms and end-users, leading to 60 interviews with the former and 120 interviews with the latter. Thematic analysis was then applied to the transcripts from these interviews, supported by Nvivo. The core themes that were identified were used to inform the development of the survey instrument. Responses from 643 end users as well as 106 solar power start-up firms were collected over a one-month period. The survey covered among other things solar product characteristics (user-friendliness, quality and durability), customer care, improved use of solar power, regulation and future training needs.

Some of the most important findings are summarised below.

On solar power products sold and distributed in the country, 81% of the firms were satisfied with the general quality of the products. However, only 61% of end-users were satisfied with the general quality of the solar power products available on the market.

Both solar power firms and end-users believe, based on their understating of the concept of ERCs, that ERCs have the ability to help improve the general quality of solar products in the market. Approximately 82% of solar power firms and end-users rate the ability of ERCs to improve the quality of solar products as either high or very high.

An overwhelming number of end-users surveyed are very willing to be trained by the ERCs. About 94% of respondents are willing to participate in training organised by an ERC near them to help achieve better use of solar power in both homes and enterprises. This comes from their belief that ERCs have the ability to provide the required training necessary to achieve this.

Respondents from solar firms are also willing to engage in this exercise with 91% of respondents very willing to work with other solar power providers to train end-users on improved use of solar power. A similar proportion (87%) also believe that ERCs can help them achieve this goal.

On the subject of energy cooperatives in communities, 93% of end-users are willing to join other users to form energy cooperatives that are supported by an ERC near them. They rate the ability of the ERC to help them in this regard as high or very high (83%).

Discussion

The findings reflect a clear demand for ERCs both by firms and by end users. The extent of the positive responses about the different roles that ERCs can perform suggest that there is a major gap in the usage value chain that can be filled by these new structures. In effect, this is an example of the seminal proposition of sensing, seizing and reconfiguring dynamic capabilities to achieve a need (Teece, 2007).

Different from seminal suggestions, the level of dynamism identified here is both at the demand and the supply side of the service and works best when firms and end users intimately interact. ERCs provide a space for this interaction, making it possible to share knowledge, identify needs and co-create solutions.

One of the most important areas of potential use of ERCs is to provide training that is relevant to both firms and end users. The evidence in the study suggests that traditional face to face approaches can be enhanced by open, online and distance learning (OODL) propositions. There is therefore an opportunity to leverage the dynamic capabilities of higher value use of solar power to attain even stronger effects. In other words, there can be a knock-on effect with major development values, in this case in applying OODL not only for training around solar power use, but also for access to and affordability of learning as a whole. ERCs therefore possess an inherent dynamic dimension that can be leveraged to help change communities at low cost. By embedding them in communities, they can become incubators for accessible, applicable and organically growing innovation. The evidence in the study suggests that such locally-oriented innovation is likely to be more accepted and to achieve more multiple effects than the externally-imposed approaches that have been used thus far. The study also points to the implications for helping develop energy ecosystems around the ERCs that reflect the needs at the grassroots.

This is an ongoing study and the pilots are now coming to an end. Initial reports from the ERC managers are consistently positive however and point to an opportunity to integrate them in policy and development work.

Conclusion

In conclusion, ERCs emerge as an innovative configuration that can significantly support efforts to attain higher value use of solar power, especially in rural and suburban locations. The high confidence expressed in their usefulness by both end users and firms offers an opportunity to develop and apply them multidimensionally. They offer a space for locally-embedded innovation and sustainable application to challenges of development and tackling poverty. The high response to offers to use them for training for both firms and end users suggests further they could also open new opportunities to apply open, online and distance learning alternatives to traditional face to face models. This can in turn have broader learning impact in other areas of strategic engagement in rural communities.

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