

“Group-it”: An Innovative Program for Scaling up Dissemination of Photovoltaic Panels

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Abstract

With 3% of the electricity produced by solar panels according to the Swiss Federal Office for Energy, Switzerland is behind the plan regarding the use of solar energy. Acceptance and dissemination of existing technology are key. This paper describes a co-designed program supporting citizens in the process of installing photovoltaic panels. The method used is based on the *Living Lab Integrative Process*, a mixed-method combining surveys, qualitative interviews and focus groups. We first explore the main motivations and barriers of the citizen with and without the co-designed program. We collected more than 350 observations to describe the main barriers to actions. We then developed a focus group to co-design the program with the main stakeholders including professionals, researchers and citizen. The principal barriers are linked to a lack of transparency in information and economic reasons. The main motivational drivers are energy independence and desire for greening their lifestyle. Support for decision making and the profitability of the panels are identified drivers which help citizens to be involved in the process and increase their motivation and acceptance regarding the program.

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Introduction

The energy transition is currently not fast enough in the world to limit global warming, according to the Intergovernmental Panel on Climate Change (IPCC) experts (IPCC, 2018). The "Strategy 2050" of the Swiss Confederation, which was accepted by the citizens in May 2017, includes ambitious energy transition targets. Three major objectives were introduced: (1) increasing energy efficiency, (2) promoting renewable energies and (3) phasing out nuclear power. In Switzerland, the penetration of renewable energy production and energy efficiency technologies is by far not sufficient to cover the 40% of nuclear energy produced today and which will disappear by 2050 (OFEN, 2019). Solar energy represents 3% of electricity consumption in the country in 2019 (SEFO, 2019).

Societal aspects are currently not sufficiently integrated into energy challenges and the financing of the required innovation. Indeed, the problem of transition is primarily a social and economic issue, not only a technical one (Hoppe & De Vries, 2019). Placing citizen at the centre of the reflection becomes essential in order to find energy efficiency solutions and develop renewable energies. Moreover, it is crucial to integrate them from the beginning of the value chain, as it can be strategic in this industry, mainly in the adoption process of these innovative ideas (Mastelic, 2015).

In order to achieve these goals, the search for technical solutions is no longer enough, many technical solutions already exist today. There is a critical lack of research and investment in social innovation disseminating and scaling up these innovations.

In order to design programs responding to the emergency of the situation in Switzerland, and globally, the aim was to develop a social marketing program proposing an innovative approach for the dissemination of solar panels. The University of Applied Sciences Western Switzerland (HES-SO) developed the "Group-it" project. More than installing, this project is aiming to support the local economy and help Switzerland toward energy transition.

The case study highlights the decision-making drivers (motivations) that motivated people to join Group-it, as well as the reluctance (barriers) that may have prevented citizens from installing photovoltaic panels.

It focuses on a community based methodological approach. The aims are to identify barriers that keep the citizen from taking the steps, the reasons why this process is successful compared to a standard process, and finally to understand the installer's point of view. Our research question is to understand why the adoption rate of the solar panel is nowadays so low in the country; and related to that, to understand why Group-it innovative process was successful. What are the gains of the Group-it process, compared to a standard one?

Methodology

The Living Lab Integrative Process described by Mastelic (2019) is the basis of the methodology of this case study analysis. What is a Living Lab?

"A Living Lab is an innovation intermediary, which orchestrates an ecosystem of actors in a specific region. Its goal is to co-design product and services, on an iterative way, with key stakeholders in a public-private people partnership and a real-life setting. One of the outcomes of this co-design process is the co-creation of social value (benefit). To achieve its objectives, the Living Lab mobilises existing innovation tools or develops new innovation tools."

In the energy sector, Living Labs can contribute to two key thematics: increasing energy efficiency and facilitating the adoption of renewable energy by consumers. These two objectives are in line with the goals set by the Swiss Confederation in its "Strategy 2050" and by the European Commission.

Open Innovation (Chesbrough, 2006), co-design (Sanders & Stappers, 2008) and social marketing (French & Gordon, 2015), are the scientific frameworks of the Living Lab Process, which is interdisciplinary. Innovation should not be confined to the R&D department of private or public companies. It has to integrate the citizens. To involve key stakeholders is not enough. Sanders and Stappers pose the user as a "co-designer" in integrating them into the entire value creation process, which is the result of a change in the roles of all the partners of co-creation (designer, researcher, user) (Sanders & Stappers, 2008).

"This sequential process takes into account multiple perspectives and allows for an increase in the number of the "social acceptance" of the solutions developed, with key stakeholders being involved from the very beginning in the research and design of the solution." (Genoud et al., 2019).

Different diagnostic and exploration tools are used to achieve the objectives. Using the Living Lab Integrative Process, our methodology is presented with different diagnostic tools below.

Figure 1
Living Lab Integrative Process



Source: Mastelic (2019)

Figure 1 presents the Living Lab integrative process that is as follows:

(1) "**Selecting a practice**" focuses to act on all the elements that make up the sociotechnical system (Geels, 2004). In this study case, the practice is the acquisition by individuals of solar panels. A literature review is necessary, with Blueprint methodology, and the Customer Journey Map, to analyse the practice. The Customer Journey Map is used to describe the itinerary followed by the customer to obtain a service or a product (Lemon & Verhoef, 2016; Richardon, 2010). (2) "**Integrating Stakeholders**" analyses key stakeholders, to understand their interest and their power of influence. With semi-structured interviews, motivations and barriers are analysed deeply. (3) "**Uncovering the barriers**" focuses on the brakes of the project. The understanding of why the diffusion of artefacts is slow is essential. (4) "**Co-designing the plan**" takes place with workshop generally. Tools from service design, design thinking, and business model design are used to integrate all the stakeholders and co-design solutions with them. (5) "**Piloting intervention**" is testing in the field of the solution. The group call for tenders is testing from an exploration project in St-Martin (45 roofs) to an industrial phase (about 400 roofs).

Feedback is collected with qualitative and quantitative interviews from all the stakeholders. (6) "**Measuring performance**" allows to better understand the key factors of success in this project.

Earlier researches have been made, in Sweden for example, explaining that the main drivers to install solar panels were for the environmental benefit, the symbolic reason. It was also to earn money from the grid and produce their own electricity, then to sell it. It was a security for the supply too. Having solar panels also shows

neighbours a commitment to renewable energy and a responsible side of the family. (Palm, 2018).

Barriers mentioned to adopt PVs are financial first, uncertainty and mistrust are also noted. "Another barrier appearing was the lack of neutral information given from an actor without any interest in selling PVs" (Palm, 2018).

A study made in England in 2005 showed the interest to better understand the perceptions of customers and to develop products that "meet their needs" (Faiers & Neame, 2005). In an American survey, the relevance of the role of information channels has been put forward (Rai et al., 2016).

Based on the Living Lab process, the methodology is now built. First, the barriers to adoption of solar panels are presented. Then, the quantitative questionnaire, which is robust, allows getting relevant replies. A second questionnaire was sent to those involved in the second stage of the process. The purpose of this second survey was to understand satisfaction with the Group-it process.

The study of barriers to the adoption of solar panels is essential to analyse the selected practice. The quantitative study makes it possible to demonstrate the results proposed in the theory. Finally, explanatory based mix-method is used, combining the quantitative study, but also a qualitative aspect. This is a sequential mix-method.

This case study is longitudinal, because we compare a standard process, with the Group-it process.

Results

Steps: Discovery of existing barriers in the literature review for people to install solar panels

As explained in the methodology, barriers and drivers were found in the literature. The existing barriers to implementation are already known and our Group-it project reproduces the same scheme. First, a presentation of the Group-it project, with some figures, is given. Research instrument will be elaborated in details, regarding its both content and foundation in theory. To complete, a satisfaction questionnaire was sent to those who paid for the complete evaluation of their roof. A mix of qualitative and quantitative information allows us to demonstrate what we found in theory.

Group-it Process

Group-it is an idea based on the aim to allow better dissemination of the energy transition, through the adoption of solar panels. It is the artefact of the case study.

First, participants register on the platform. They then receive a pre-evaluation of the solar potential of their building, free of charge.

They then decide whether to continue to the second stage of the project. This second stage requires an investment of 290 CHF to continue the process. A visit to the building is organized and guidance is offered.

Two best offers are received from all the bidding companies. One of the proposals is chosen. A counter-visit is organized, and if the final offer is validated, a signature of the offer is made and planning of the works is proposed.

This idea, developed within the framework of the research institute at the HES-SO in Sierre, has met with real enthusiasm, with 2,290 owners registered on the platform following the switchover to RTS television in November 2017, during their programme "Plus 3 degrés".

Following this, 23.4% of those registered, i.e. around 536 people, decided to pay to continue the second stage, by receiving offers and being accompanied in the choice of their solar installation.

Installers could sign up to bid on tenders, in lots of 20 roofs. This part of the process was completed in March 2019. A total of 394 roofs are installed as a result of this project.

In parallel to this process, two quantitative surveys were sent out in order to understand people's interest in this project. In February 2018, a quantitative interview was sent to the people registered in the Group-it project. The goal was to understand their revenues, electric consumption, and household composition. Information about motivations, barriers and expectations were also collected. 1372 answered it, and then an additional satisfaction survey was sent in December 2018, to understand why people stopped the process or why they continue with Group-it. 364 answered to the second survey.

The design of this process removed barriers to the various stakeholders involved. Following the identification of these barriers, the program was co-developed with the installers. A focus group was organised in April 2018, bringing together 30 people. With the installers, focus groups allow understanding the same objectives as for citizens.

This method is successful because the barriers to potential customers could be raised. Indeed, a simplification of the transmitted offers, a taking charge of the whole process related to the acquisition of offers, or decision support has made it possible to transform this project into a success. We involved people from the very beginning of the process.

Numerical results are now presented, making it possible to confirm what has been put forward in this first part.

Quantitative Analysis of the "Group-it process", household vision

Analysis of the sample

The quantitative survey is based on a sample of 1372 answers. R and Sphinx are the two software used for that. A simple descriptive analysis was carried out, this description carried out mainly on socio-demographic data, obstacles, and motivations. The Chi-square was used to test for cross sorting. This test is used to establish whether there is a dependency between the variables, or not.

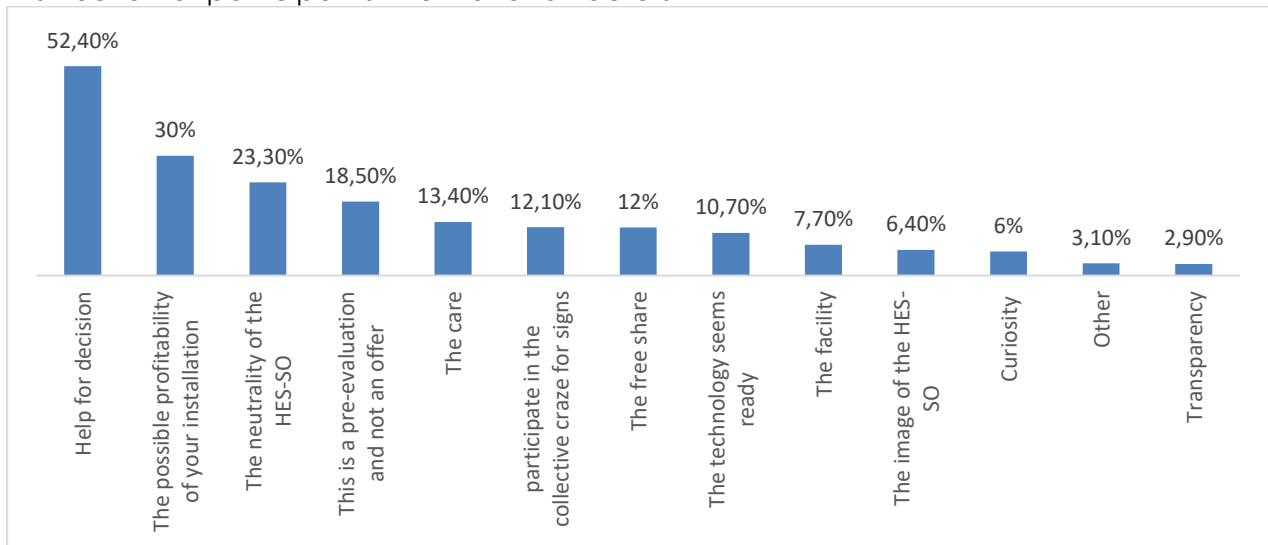
The survey is not representative of their structure from the household's statistics in Switzerland. In Switzerland, 35% of the household is composed of one person, whilst 6% is represented in this survey. The household included couples without kids is overshadowed by 10%. The national statistics mentioned 8% of single-parent families. This composition is found in 1.2% of the sample. The average electricity consumption of the sample is 7,661.4 kW/h per year, confirming that the "clients" of the GROUP-IT project are many families living in single-family houses.

Motivations and Brakes

Motivations of participants to enter the Group-it process

In the registration questionnaire, questions have been asked about the motivation to participate in this Group-it project (Figure 2). Twelve factors were proposed, and people had to choose two out of the twelve. Help for decision-making is by far the first motivation for people. At 52.4%. The need for advice and support represents the motivation driver for participants. Then, the economic questions rank in second, with 30% of answers. In the third position, the neutrality of a research institute is the main principle motivation for 23.3% of participants of the questionnaire.

Figure 2
Distribution of participants' motivational factors

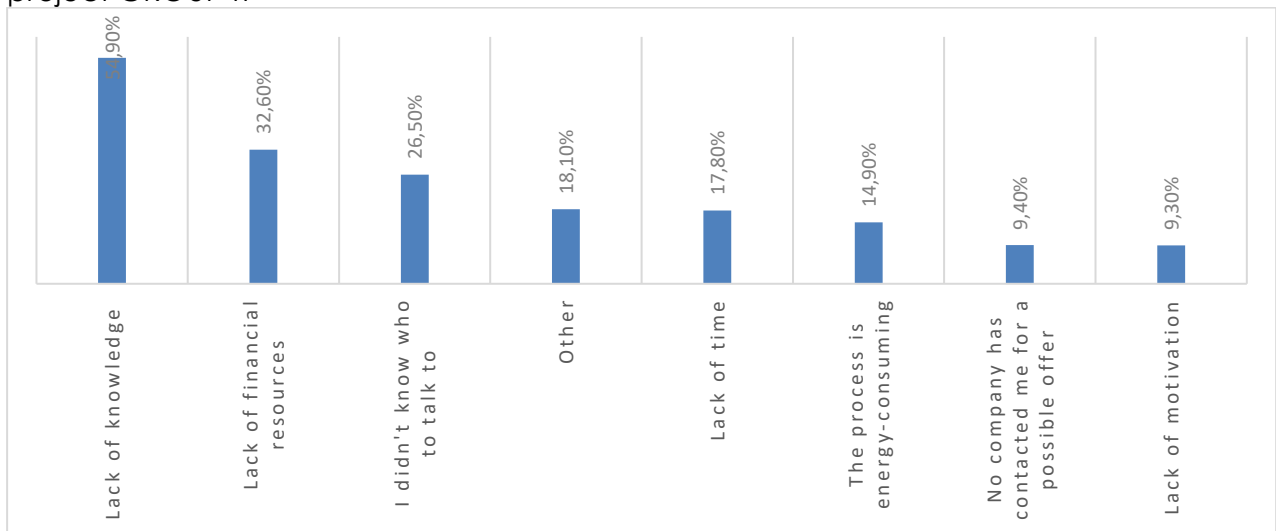


Source: Author, based on Genoud et al. (2019)

Barriers of participants not to install solar panels

Total of 55% of the panel answered that the lack of knowledge was the reason why they did not approach PV installation (Figure 3). Lack of financial resources is the second answer, answered by 32.6%. "I don't know whom to address" consists in the third answer (26.5%).

Figure 3
Distribution of the obstacles to a proactive approach to PV installation before the project GROUP-IT



Source: Author, based on Genoud et al. (2019)

The link between motivations and barriers

The Chi-square test showed that there is a 99% probability that the variables are correlated with each other. People who answered to the lack of financial resources have indicated that the fact of "free of charge of the action" and the "pre-evaluation" were important in the motivations. The fact that the Group-it process is simpler as the standard one reveals the difficulty of these. People answered that the

lack of time was a barrier in the standard process. It is directly correlated to the simplicity of the Group-it process.

People who decided to continue the process

People who needed more help for decision-making stayed in the process for the second step more easily. Annual household income, economic indicators related to profitability, and the need for decision support were the three variables that had the greatest impact on homeowners' choices.

As explained before, 2290 people answered to the Group-it' first call. 23.4% of them continue the second step in paying CHF 290 for potential analysis of their roof. In the end, 394 households have been accompanied in the installation of their solar panels.

As seen in studies from other countries, the first variable that appears to be significant for the rest of the process was the income one.

In total, two variables were dependent in the answer: "Before the Group-it action, what prevented you from putting photovoltaic panels on your roof?", the answers were: " I didn't know whom to address", and the "lack of financial resources". The group-it process shows the need for neutral information and a personalised support follow-up, without resolving the financial issue for all that. Thanks to the removal of barriers to entry: the high existing acceptance rate allows us to say that with the removal of barriers, people adopt solutions more easily.

Installers' point of view

Solar panel installers consist of one of the most important stakeholders. In April 2018, a co-design workshop allows installers to express their point of view and to understand the consequences of a project like Group-it.

Both positive and negative aspects were expressed by installers. The highlighting of this activity was beneficial for this field of activity. Indeed, prospection was almost no longer necessary. The neutral position of the University, which has no sales role, reassured potential customers. The high-quality work and the scientific input of this process were much appreciated by customers and installers alike.

On the negative side, the volume of roofs on offer was sometimes too large for small businesses. Installers are also aware that there will be more competition, due to Group-it process.

Discussion

The research question was to understand how this Group-it process promotes acceptance and reduces barriers to entering the PV installation process: (i) Lack of knowledge, (ii) financial resources and (iii) contact information were the three main barriers. Lack of knowledge is an important barrier to behaviour change. The economic stakes are not to be neglected in this project. Many participants in the pre-evaluation did not decide to continue for financial reasons. The banking sector could refocus its activities by financing the energy transition. Still, too many people cannot afford to invest in solar panels "simply" for financial reasons.

Weak knowledge of people in the energy field explains here the first brake existing not to install solar panels (Kollmus & Agyeman, 2002).

The success of this approach has been the ease of access, neutrality but also the potential financial return that exists. These positive results are directly linked to the expectations expressed by the participants. The aim of this new methodology proposed in the Group-it project was to understand what the expectations of current customers are. Why do not these people engage in PV installations? The

expectations expressed and the results of the participants in the questionnaire showed real links. Involving the installers in the discussions was essential to understand their point of view as well because, without them, the process could not have been achieved. Social marketing theories propose in their methodology to identify barriers to change, to respond to stakeholders' expectations, but also to co-design solutions and innovations with them.

This project highlighted the importance of changing users' behaviour. Barriers to adoption were first discovered and analysed. This led to a better understanding of the needs and expectations of potential consumers.

The results of this survey have brought to the front what has been described in theory.

The scientific contribution of this project is to have gone beyond the stage of identifying barriers to citizen involvement in PV installation. The co-design created in the Quadruple Helix (4P'S Model - Private-public People Partnership, made of academics, government, civil society and industry), showed the involvement and integration of installers in the reflections.

The economic players were also involved in the reflection, as they were essential to understanding the financing of this type of project as well as the current stakes of the market. Partners such as the bank have also been integrated, in order to support the installations and their financing.

After this co-design stage, the adoption process was made possible thanks to the support of RTS, the Swiss Television Program, to lift one of the ways related to communication. The type of communication and marketing conducted on PV awareness will influence the thinking of potential future customers (Rai et al., 2016).

The group-it process revealed reasons why the adoption rate for the second phase was not 100%: the first phase was free, so they obtained the pre-evaluation. The second step was paying, so they stopped. The second reason was the financial investment, which was under-evaluated by participants during the first step.

The managerial contribution was to help SME's in the dissemination of solar panels. It helps to answer a community need. This use case demonstrated the value of social marketing and social innovations by integrating citizens. This project is part of a series of different projects, showing that it is possible to measure the impact created through the Living Lab process methodology. The return on investment of the Group-it project is enormous, considering that about 400 households decided to have solar panels installed on their roofs. At an average of CHF 20'000 per installation, the total investment amounts to CHF 8'000'000. This existing interface between social marketing, social sciences, and integration in socio-technical environments is described in Geels' theory (Geels, 2004).

Conclusion

In this paper, the Group-it program, developed by the University of Applied Sciences Western Switzerland was presented. Based on the *Living Lab Integrative Process*, a new methodology was proposed to integrate stakeholders to scale up new installations of solar panels in Switzerland. The energetic emergency existing nowadays needs to be answered faster and globally.

The co-design process presented in this use case allows us to go one step further because after having identified the existing barriers, the co-design with the actors allowed the adoption, which concluded with the installation of 400 photovoltaic panels.

To achieve these ambitious goals, scale-up is necessary. Group-it projects are now being developed in various regions. The "Green Deal" needs a scale-up for other

regions. The behavioural study carried out at the SFOE made it possible to highlight the existing barriers and motivations concerning the installation of solar panels. The study of the market and its evolution remains essential in order not to pre-empt any stakeholder.

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