A Web-Based Interactive Questionnaire for PV Application

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ABSTRACT

Questionnaire is a fundamental method for investigation and research, but participants get tired about it, because of the impression of being long and boring, which causes low quality of research. The authors developed an interactive questionnaire as an effective method to involve responder actively. The development of this tool is dynamic process, which goes with a research project called Sunrise-PV. The project is led by the University of Southern Denmark and is collaboration between local organizations to popularize PV system in both residential and the industrial buildings. For such an innovative research, the authors adopt participatory design as research method to develop the research tool in several iterations. Moreover, the authors get a balanced perspective between user needs, market viability, and technical feasibility, which guide their research focus on the artistic and usability aspects, and also raise product concepts and the concern of technical issues.

Keywords: Building Integrated Photo-Voltaic (BIPV), Interactive Questionnaire, Participatory Design, Photovoltaic (PV) System, Sunrise-PV

1. INTRODUCTION

Questionnaire development is key to a successful research result. People has general impression that questionnaire is boring and tediously long. Bad questionnaire cause people even aversion to the research topic and get low quality research data. We are aiming to develop an efficient and attractive way to design questionnaire. The This Paper mainly introduces our development process and development result of an interactive questionnaire. It also includes part of the research result from this tool for Sunrise-PV project. This development process is dynamic, that means the tool is used in from the beginning of the research and was revised in each step.

The Sunrise-PV project is an industry-oriented project led by the Mads Clausen Institute (MCI) at the University of Southern Denmark and with the participation of Danfoss Solar Inverters A/S (DSI), Sydenergi (SE), Linak A/S, Esbensen Rådg. Ing. A/S and ProjectZero A/S. The project is partly funded of the Danish “Region Syddanmarks Vækstforum” and the European Regional Development Fund. Two large solar plants are party financed by the project, a 28 kW PV-plant on EUCSyd and a

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coming 80 kW plant at Produktionshøjskolen, both in Sønderborg, Denmark. The goal of the project is to develop new concepts, technologies and products in the field of PV systems with the main purpose of generating new jobs and companies in Southern Denmark. The activities in the project include both technical (inverter technology, tracking and control systems) as well as user-oriented and design-oriented activities with the focus on Building Integrated Photovoltaic (BIPV).

To specify the research direction for southern Denmark, we utilized a user research by the principle of participatory design to promote the stakeholder and companies’ cooperation, and to carry out a reasonable design solution, which fits the local geographical condition. We defined the research questions as “How to improve the value and competences of solar energy for residential areas compared to other mainstream renewable power sources”. In parallel, we put focus on developing the interactive questionnaire as well, which is based on another research question “how to develop an attractive questionnaire for user research to involve responder actively”.

2. THE RESEARCH

2.1. Research Issues

The growing trend of solar energy attracts more companies and institutions to make effort for future energy supply. As to a general cognitive, solar energy has low efficiency, unstable current flow, and high price. But today, the fact is changing faster and faster. A well-designed system and a well-selected place will generate considerable power at a competitive price. A Photovoltaic (PV) system consists of several high technological components. The market, installation environment, and local user’s preference should be considerate all during research. Participatory design balances the perspectives between different fields and involves more people to think together to contribute design concepts (Weller, 2010). We believe that building an interactive tool can facilitate user research effectively and get higher quality research result. The development of this tool, subsequent user research, and usability testing is part of the Sunrise-PV project.

PV has advantages regarding environmental acceptance, as distinct from wind energy produce shadow effects from wings or acoustic noise. They also have little visual impact on the landscape. The requirement of the place for setting up a solar system is low. However these advantages are not common sense of the public. The focus of utilizing energy could be very practical like price, payback time, and how difficult to get. To take PV energy into mass markets, we need to facilitate from two directions. One is to hear the perspectives from end users, technicians, government, and scientists. The other is to popularize the knowledge and current state of PV to the public.

The initial focus was put on residential buildings. To get practical experience from private house owner and professional knowledge from stakeholders, questionnaire is necessary for the investigation. However a bad questionnaire could scare responders and lowers the quality of the investigation. Therefore, we decided to develop a web-based program that people can play around to explore the basic knowledge of PV system and contribute their personal knowledge in to our research as well. The purpose of designing a playable program is that making responders enjoy the process of answer the questionnaire and participate the research actively. The main questions for developing this program are how to choose the content and which playable interactions are suitable. The participatory design process provided rich materials to solve these two issues.

2.2. Web-Based Interactive Survey

The reason of we chose web-based interactive questionnaire is because we need to reach people resident with a long distance, the research area is quite wide, and lots of basic technical knowledge need to be popularized. The research of current state of web-based survey help us improved the quality of the questionnaire.
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