fast facts

Project: PIPA: A Cloud Based Application Measuring and Controlling Electricity Used for Indonesian houses
Lead Organization: Binus International University
Country: Indonesia
Budget: 23,182.00 AUD

situation

Indonesia has more than 238 million inhabitants, making it the fourth most-populated country in the world. Due to this population, net electricity consumption is increasing drastically, as is the price of electricity. Electricity waste is also a growing problem, contributing to a variety of inefficiencies and monetary burdens for both the household and country. Blackouts are common, which are both inconvenient and dangerous. Energy waste is one of the contributing factors to blackouts, but this waste may be reduced though household energy monitoring so that individuals can better understand and respond to electricity consumption, leading to improved energy management and cost savings.

solution

The goal of this project was to change how average Indonesian citizens use electricity and to teach them how to increase their energy efficiency. This will not only lower their electrical costs, but create less strain on the expensive and stressed national electrical infrastructure and decrease blackouts. A related goal was to increase awareness of the benefits of "greener" living: home-based electrical monitoring may help households understand their energy consumption patterns and more effectively read their bills from the National Electricity Company, the partner in this project. The PIPA project, which is an abbreviation of *Pemantau Pengendali Arus (*or Electricity Control and Monitoring), is also the Indonesian word for "tube", which is an appropriate metaphor for the overall project: an end-to-end information system that connects users to energy consumption data. The PIPA project objectives included:

- *Changing the behavior in electric usage at home for economic reasons;*
- *Fostering increased awareness of the benefits of saving electricity, such as more equitable electricity usage in remote or economically-strained areas;*
- *Promoting greener living for the benefit of both person and planet.*

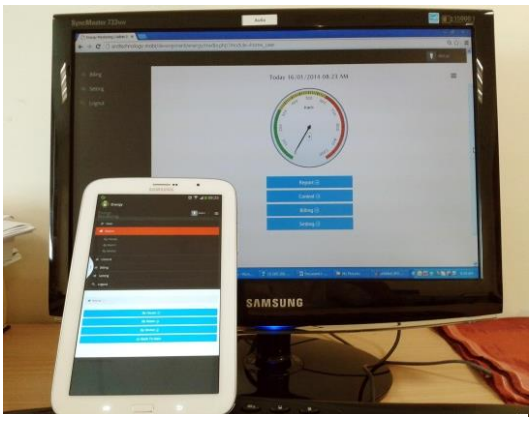
PIPA is an Arduino- and cloud-based application that allows energy usage data to be collected from all rooms and appliances in a house without having to monitor or disrupt the electricity meter from National Energy Company of Indonesia (Perusahaan Listrik Negara – PLN). Currently, PLN bills only display the total amount due, with no disaggregated statistics about energy usage. This is not very useful in helping citizens plan their electricity use and consumption, and most Indonesians surveyed as part of this project attribute inefficient household electricity usage to users forgetting to turn off appliances or leave devices in standby mode. Using an Arduino board and current transformer, PIPA captures electricity use at the room level. Using an Android mobile application and cloud service, appliance-level electrical use data is recorded and made available. The Android mobile application also allows for electrical devices, such as lamps, to be turned on and off via phone or computer. This feature provides an easy way for the users to monitor and control their electricity consumption at home based on real-time information. This feature is expected to give home occupants a simple way to monitor and control their electricity consumption.

The PIPA system was tested in a "prototype" house that included two rooms and consisted of a lamp, a television set, an air conditioning unit and a desktop computer. There are three distinct components to the PIPA system.

- PIPA Reader v1.0 – this is an Arduino module that monitors the electricity spent from electronic devices, and stores energy expenditure data in a server.
- PIPA Mobile v1.0 -- this is a mobile-based application that lets the household manage and controls the electricity consumption at home. Appliances that are connected to the PIPA Reader can be turned on and off via this application.
- PIPA Online v1.0 -- this is a cloud-based application that lets the household manage and control the electricity consumption at home. Appliances that are connected to the PIPA Reader can be turned on and off via this application.

The PIPA team has identified key project beneficiaries as educates middle and upper income households, as these households are the most likely to contribute electrical "waste" due to the number of rooms and devices per household. Based on the 2012 demographic data from the National Indonesia Statistic Agency, the PIPA project has planned to test the system in approximately 17% of national households, primarily in Jakarta. The team plans to reach the intended user base though surveys and social media campaigns in collaboration with the National Electricity Company, and plans to hold training and awareness meetings on an ongoing basis.

Binus University partnered with the National Energy Company of Indonesia (Perusahaan Listrik Negara – PLN), hardware developer PendekarTeladan (PT), and several electricity sector experts. PIPA team members sought additional training in ITIL (Information Technology Infrastructure Library) to learn how to best manage the overall project lifecycle and implementation. Currently, The PIPA team is pursuing additional government and private investment, and is researching commercialization opportunities that protect the intellectual property of the solution while being in compliance with the ISIF-approved licensing schemes.



Application

outcomes

- Usability testing was conducted with a 77% satisfaction rate
- Presented a technical report at the 23rd IBAMA International Conference in Spain
- Potential technology transfer opportunity with University Polytechnic of Catalunya

Home prototype

project contact

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