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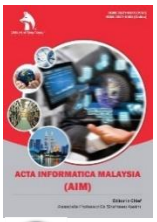

REVIEW ARTICLE

CONSUMER CONCERNS ON SMART METER USAGE IN MALAYSIA

Siti Nur Hidayah Malek, Afida Jemat*

Institute of Informatics and Computing Energy, Universiti Tenaga Nasional (UNITEN), Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia.
Corresponding Author Email: afida.jemat@uniten.edu.my

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ABSTRACT

A smart meter is a device to replace outdated traditional meters to track the usage of electricity in real-time with more accurate measurements of energy consumption. In addition, smart meters are also able to record the time of use in short intervals and can be read remotely by the utility. The replacement of smart meter for all houses are a part of the Malaysian government's initiatives to monitor energy consumption among Malaysians. On top of its advantages, there are some consumers still concerned over several matters such as an increase in electricity bills, security and privacy on personal data protection, health problems associated with the radio frequency (RF) of smart meters, and reliability of the data storage. This study aims to review the customers' concerns and to propose recommendations for improving the awareness of smart meters' benefits. In summary, this paper presents an overview from the customer's point of view and also how to overcome their concerns regarding the use of smart meters instead of traditional meters.

KEYWORDS

Concern, Consumer, Electricity, Energy Usage, Smart meter.

1. INTRODUCTION

Smart meters are created to manage electricity needs in large populations and make it more reliable and useful for electrical devices. Moreover, the smart metering technologies offer various possibilities for an electricity system that enables time-of-use (TOU) tariffs to reduce peak electricity consumption (Communication, 2011). Smart meters can analyze energy costs, breakdowns and power quality. In addition, smart meters can detect the presence of unwanted generated sources, thus helping to identify and correct the source of the problem (Lee and Hess, 2021). In Malaysia, Tenaga Nasional Berhad (TNB) is a major utility supplier for electricity that plans to replace traditional electromechanical energy meters to smart meters. The traditional accumulation meters display the cumulative amount of electricity used, to enable manual readings at regular intervals, usually monthly. The biggest advantage of having a smart meter is that there will be no traditional meter reading because both TNB and the consumer can get readings remotely in "real time" (Dharfizi, 2018)

It also saves time and manpower to get the reading of electricity usage and reduces the likelihood of human errors while reading and avoiding site visits. There is also the possibility that it will reduce carbon emissions as there is no need for TNB to send their staff out in vehicles to check meters using the old way. Perhaps TNB and the government can also use machine learning algorithms on the data collected from the smart meter system and provide useful information to consumers so that the use of these smart meters will foster good energy savings by increasing the detection of electricity supply interruptions from every home. or homes with smart meters (Tenaga Nasional Berhad, 2021; E.on, 2021; Gov, 2016). At first, the implementation of smart meters was intended to encourage consumers to manage their electricity usage. However, there are concerns from the customer's perspective about the use of smart meters and that might affects their acceptance level towards them if not taken seriously.

Since 2014, Malaysia has already started the usage of smart meter that comes with an "in-home display" to show electricity use in real-time. Real-time visibility is shown during energy usage, which is easy to read from the digital monitor of the smart meter (Nasir et al., 2020). Figure 1. shows the comparison between electricity metering systems and the traditional and smart meters in data collection and reading for billing. While the data in traditional meter readings are taken by the meter readers once a month, the smart meters is able to store every data for half an hour and can be updated daily. Traditional meter still needs the reader to physically come to record the information on the usage of the electricity. In contrast, smart meters are automatically transmitted the data to the metering company. Instead of one-way communication, which is the structure for traditional meters, the smart meter implements a dual communication concept, which uses a gateway communication and the database as the storage medium. Thus, consumers can check their billing using a certain application to get information regarding electricity usage (Wang et al., 2019).

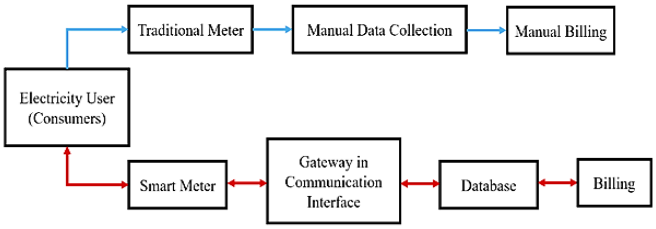

Figure 1: Comparison of Traditional Meter and Smart Metering System (Kumari et al., 2020)

For a better energy experience, using a smart meter is recommended because it is more reliable and easier to track energy consumption. It still works the same as the existing energy meter, which measures and displays electricity consumption at home but is a little more advanced where it allows users to monitor consumption directly through the accompanying smartphone application (App) or website. It will report the

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real-time energy information to the control center. For example, the myTNB application allows the customer to view and pay bills anytime and anywhere for time-saving and there is already an in-creasing number of users for this application on this digital platform. The information can help to save electricity usage and money. The benefits of using the smart meter are that the consumer can view the real-time reading of the electricity usage and the bills are more accurate because the recording is automated. Then, the electricity data can be accessed, tracked, and adjusted so that the user can analyze their electricity usage patterns and monitor them at any time (Nasir et al., 2020).

This paper aims to identify the consumer concerns on smart meters and presents the outcomes as recommendations for the utility provider to do actions accordingly toward ensuring the acceptance and willingness of the consumers to install the smart meters. The specific objectives of this study are to identify the published work on consumer concerns regarding smart meters, to analyze the consumer concerns regarding the installation of smart meters, and to provide recommendations to the utility provider so that all important concerns regarding smart meters are addressed.

2. Consumer Concerns

Some concerns about smart meters have arisen and become a problem when households lack of knowledge regarding energy consumption. For example, the energy consumption unit is measured in kilowatt-hours (kWh) and not explained clearly by the utility provider. An increased in electricity bills associated with the use of smart meters have been reported (Kumar et al., 2021). Also, there are some complaints include an unoccupied home being billed more than double from previous amounts after the installation of a smart meter (Yesudas et al., 2015). Others are several concerns over security and privacy that arise from data retrieved on electricity usage and the transmission system. However, the utility provider had secured their installation system by adding strong cybersecurity in the system so that the information of the consumers cannot be observed by other parties (Yesudas, 2015). Next, the smart meter that causing health problems. The intolerance to electromagnetic fields or radiofrequency radiation and electromagnetic hyper-sensitivity was raised by the consumer over smart meters (Le et al., 2016).

2.1 Concern Classification

Table 1 shows a summary of the constant comparison analysis result. It also shows the differences in concerns on smart meter usage.

Table 1: List of Consumer Concerns on Smart Meter

No	Theme	Category	Concern
1.	Security and Privacy Concerns	Illegal Uses	i. Theft detection will be active if the residence is unoccupied (US Department of Energy, 2016) ii. Stalker or hackers track the movement of the victims (Imen and Azzouz, 2015)
		Consumer private data	Concerns over personal data details can be easily accessed or hacked by unauthorized companies or utility providers (Tomasz, 2014; Lee and Hess, 2021)
2.	Exposure to Radio waves or Radiation	Health Hazard or Harmful Effect	i. The harmful of smart meters and high risk to health (Nasir et al., 2020) ii. Exposure to electromagnetic fields triggers health problems (Chakraborty et al., 2021)
3.	Billing of Energy Usage	Total of energy usage	i. The accuracy of billing readings (Rastogi et al., 2016) ii. Huge amount of electricity bills after smart meter replacement (Aris and Azizan, 2020)
4.	Storage of the data	Data Storage	i. The reliability of data storage on smart meters Ability of the database system can store information on energy used (Billewicz, 2015; Kumari et al., 2020)

2.1.1 Security and Privacy Concerns

Smart meters may seem like an easy solution to any energy setup however, just like any other device, there are some security risks to smart meter users. Once connected to the Advanced Metering Infrastructure (AMI), which provides an access point for hackers and other malicious actors, smart meters transmit data 24/7 and will leave an all-day window for attack. From there, hackers can adjust bills, take payment information without either party ever knowing. Although no any major attacks has been reported through smart meters yet, it is important for energy providers, and the users they supply, to stay on top of device security. The stakeholders should make sure to maintain secure connections and use connected devices wisely all the time to ensure ongoing security instead of doing so after an attack occurred. In fact, the smart meter provider has already secured their installation system by adding strong cyber security in the system so that user information cannot be observed by other parties (Yesudas and Clarke, 2015).

2.1.2 Exposure to Radio Wave or Radiation

Referring to the radio frequency (RF) wave in connectivity that is generated from smart meters, consumers are concerned that it can cause health problems and trigger extreme exposure to electromagnetic fields in electromagnetic hypersensitivity. Although this matter has been raised, it is minimal and relatively, at a low level especially compared to other gadgets that are used daily such as smartphones, Wi-Fi, and microwave ovens. Quoting speech from Dr. Azadeh Peyman, a Principal Radiation Protection Scientist from Public Health England (PHE), "The level of radio frequency waves produced from smart meters is typically one million times less than the internationally agreed guidelines" (Dawood et al., 2013). An adverse health effect from RF radiation (RFR) is focused on electro-hypersensitivity (EHS), but not every consumer is electrosensitive. There are studies from public health physician correcting the gross misinformation regarding the effect and also claiming that the smart meters pose no risk to public health and the exposure of RF is already being reduced (Carpenter, n.d).

To ensure a successful rollout of smart meters nationally, the government and the TNB must put more strong effort to increase public awareness and reducing consumers' concerns regarding the use of smart meters. Based on the result of this study, findings on the concern towards smart meters will become a guideline for TNB to distribute the information and more awareness towards smart meter use. A recommendation by using social media such as Facebook and YouTube sites as advertisements and sharing some content related to the smart meters will gain provide more understanding to the consumers or users about the smart meters. The campaign through social media also can be suggested as a platform to target certain age groups by addressing the knowledge of smart meters with functions such as easy monitoring real-time of energy use through the myTNB application, benefits, long-term implications, financial impact in billings and.

In social discussions, experts can address the concerns about smart meters such as the security of personal data, energy electricity rates, health effects, the accuracy of billing and et cetera. Other than that, the platform can also include positive feed-back, experience sharing, and get expert advice on the usage of smart meters (Alkawsi et al., 2020). This RF component has gone through various inspection and testing processes by relevant bodies in many countries, including Malaysia through the Communications and Multimedia Commission (MCMC). Smart meters had already ongoing in-depth review from the World Health Organization (WHO), which has conclusively proven that the small amount of RF produced is not harmful to human health. They have also been approved by SIRIM so, from all of these testing measurements, it can be assured by that having a smart meter in your home is not harmful to your health.

2.1.3 Billing of Energy Usage

Some customers are concerned and complained about the rising electricity bills with the use of smart meters. One of the complaints is that unoccupied houses are billed more than twice the previous amount after the installation of smart meters (Nasir et al., 2020). However, the utilities responded that the total bill was accurate and that the bill increase might be due to inaccurate measurements with traditional meters, leakage or theft of power.

2.1.4 Storage of the Data

Smart meter reliability also has been questioned. The technology in smart meter data storage using cloud computing can enhance data security. The

threats may appear because the smart meter still can store a small amount of data. These clouds work as the local memory. When the smart meter is online, the data will be recorded in the cloud while offline, the data will be stored in the memory. The offline data will be sent immediately to the cloud once the meter is online (Billewicz, 2015). All of this information is very important to be highlighted because the concerns from consumers can be reduced if they are properly addressed as will be discussed next.

3. RECOMMENDATIONS

3.1 Increase Publicity to Improve Awareness

In order to avoid public reactions against smart meter usage, more publicity is needed to improve public awareness and needs to be voiced out as planned. As a major utility provider, TNB has been tasked with regulating the use of smart meters in Malaysia. There are various mediums of communication channels of can be used to inform the consumer regarding the importance of smart meters such as advertisement on boards, in newspapers, on television, distributing flyers, and on the radio. This action will help consumers make choices based on higher smart meter usage. The sharing of information is expected to increase awareness among consumers to accept and be willing to install this new smart meter in their homes without thinking about the concerns that arise (Nasir et al., 2020).

3.2 Spreading Information Through Social Media

Social media is the most effective tool to distribute and share information regarding smart meters with the public. Social media plays a huge role in giving the message through the website, Facebook, Twitter, and YouTube so that the consumers can be exposed and receive the content directly which is more personal and specific through their network of communications. Social media also needs to be more assertive and use convincing words such as "user", "concern", "smart" and "meter" through Twitter or Facebook accounts. This is because the common characteristics will be followed by users and will become a mechanism to earn more attention. Another way is by sharing clear and concise messages through social media or using “Please Retweet” or clicking “Share” as a call-to-action that will help to reach a goal even though it is too desperate to ask the network to repeat the updates (Chawla and Kowalska-Pyzalska, 2019).

3.3 Campaign

In addition to media hype, the use of campaigns can also be considered, especially for the elderly who are not familiar with social media. By campaigning as well, smart meter information can be publicized face-to-face and it is easier for potential users to ask questions related to the use of smart meters. Campaigns can be started by the electricity supplier itself first, then other parties can join in, especially government bodies or other private bodies such as Sustainable Energy Development Authority (SEDA) Malaysia. Additionally, each TNB branch throughout the state can make this campaign program periodically, for example 2 times a year.

3.4 Discount of Special Tariff

Apart from the suggestions above, giving discounts or special tariffs for customer of smart meters in the first month may attract more users. For example, in United Kingdom, there are several special rebates offered by electricity providers to give privileges to loyal users while also attracting customers to use their services. In brief, all these efforts need to be done continuously so that users are convinced of the benefits of using smart meters in addition to being able to provide the value that needs to be paid accurately.

4. CONCLUSION

In this study, consumer concerns about the use of smart meters are discussed. Smart meters have great potential and consumers need to change their perceptions as smart meters are more reliable than traditional ones. By using a smart meter, it has been proven that there is significant progress in terms of cost, security, and privacy risks. Thus, we proposed some recommendations to address consumer concerns and benefited to the user. We believe that providing the latest information on the smart meter to the user, will help them to understand more and raise awareness of it. In short, it is hoped that with proper understanding, consumers will use smart meters voluntarily rather than by force.

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