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MODELS OF EFFICIENT ENERGY BEHAVIOR IN HOUSEHOLD: THE USE OF THE "NUDGE" IDEAS IN DESIGNING ENERGY SAVING PROGRAMS IN INDONESIA

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Abstract

The idea of "Nudges" is used in selected architectural programs designed to reduce the use of household's electricity consumption. Experiments carried out through feedback information provided to the households studied. Investigation of consumer behavior patterns on energy efficiency in question is to investigate the factors that influence the households energy consumption based on standard characteristics and household socio-economic characteristics. The research model used the 'Non-Equivalent Groups Design' (NEGD) framework for both 'the observed group' and 'control group'. The results of this study showed that 'social norm and curtailment (nudge type 1 & 2)' have impacted the motivation of reduction of electricity consumption in the rural area. The descriptive statistic and MANOVA Analysis were used to analyze the energy efficiency in a rural household in Indonesia.

Keywords: *Nudge, Social Norms, Curtailments, Households Energy Efficiency*

Research Highlights

The results of this study showed that 'social norm and curtailment (nudge type 1 & 2)' have impacted the motivation of reduction of electricity consumption in the rural area.

Research Objectives

Investigation of consumer behavior patterns on energy efficiency in question is to investigate the factors that influence household consumer behavior based on standard characteristics and household socio-economic characteristics. The research model used the 'Non-Equivalent Groups Design' (NEGD) framework for both 'the observed group' and 'control group'.

Methodology

The research model used the 'Non-Equivalent Groups Design' (NEGD) framework for both 'the observed group' and 'control group'. The authors divide into two groups of households, i.e. observe households (self-selected), and control households (randomly selected). Both observed and controlled households must have an active electricity account for at least one year, with an area of between 200 and 50 square meters. The selected target respondents only

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use electrical energy sources not to produce or conduct business activities, bearing in mind that many household units conduct their MSME businesses starting from within their homes. Total household electricity consumption depends on 1) house attributes, such as size; 2) equipment attributes; and 3) intensity of the use of equipment for recreational and household activities. These choices, in turn, depend on climate, price, and personal attributes, including brands. It can be said that this study uses an experimental method with Non-Equivalent Groups Design ("NEGD"), which is the form of research most often used in social research (Sudarmaji & Mira, 2019, Enkel, Bell, & Hogenkamp, 2011; Shadish, Cook, & Campbell, 2002; Trochim, 2002). NEGD appears when program participants are treated differently. So that selected respondents who use electrical energy as input in generating comfort (eg temperature in the room) and family recreation activities. The main strategy of this research is to provide additional information to observe or intervention the household group, which is used as an 'observed' variable to other 'controlled' groups. Some additional information on limitation and efficiency behavior taught in the Observe group can be described as follows: 1) Turn off the lights when occupants leave the room, 2) replace old light bulbs at home with energy-efficient consumption, 3) Washing clothes during pick-off hours and only done when there are enough, 4) Replace high-consumption electrical appliances (eg dishwashers, irons) with more energy-efficient models, 5) Turn off the computer and monitor when not in use.

Results

Based on the multivariate test analysis, it can be stated that there is a very significant difference between the observed group and the control group. By using Multivariate Analysis of Variance ("MANOVA"), we can see the difference between the variables 'social norms (nudge type 1)', 'curtailment (nudge type 2)' and 'social norm and curtailment (nudge types 1 & 2)'. From the test results stated well according to Pillai's trace, Wilks' Lambda, Hotelling's trace, and Roy's Largest Root are that all indicators have very significant differences between the two groups. In the Wilks' Lambda test results, the result is 0.202, at F (3.58) with a value of 76.49, with a P-value = 0.000 which is stated to be smaller than <5% while Partial n2 is worth 0.798. Using statistical analysis, there are significant differences in the variable 'social norms (nudge type 1)', 'curtailment (nudge type 2)' and 'social norm and curtailment (nudge type 1 & 2)' between the group observe and the control group. To analyze the effect or influence of the architect's

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choice through nudge on electricity (energy) costs in both groups, the MANOVA analysis is also used where the NEGD model is tested to predict the results of the nudge type 1 and type 2 architecture choices in urban environments. Indicators of the mean and standard deviation of variables 'social norms (nudge type 1)', 'curtailment (nudge type 2)' and 'social norm and curtailment (nudge types 1 & 2)' which affect the motivation of reduction of electricity consumption shows a very significant result between the two groups. The table below shows the differences in the mean and standard deviation indicators between the two groups.

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Social Norms (Nudge type 1)	367,758[a]	1	367.758	88.81	.00	.597
	Curtailment (Nudge type 2)	154,903[b]	1	154.903	33.08	.00	.355
	Social Norms & Curtailment (Nudge type 1 & 2)	471,629[c]	1	471.629	130.04	.00	.684
Intercept	Social Norms (Nudge type 1)	52548.790	1	52548.79	12690.31	.00	.995
	Curtailment (Nudge type 2)	49508.129	1	49508.13	10572.34	.00	.994
	Social Norms & Curtailment (Nudge type 1 & 2)	53719.758	1	53719.76	14811.56	.00	.996
Group	Social Norms (Nudge type 1)	367.758	1	367.76	88.81	.00	.597
	Curtailment (Nudge type 2)	154.903	1	154.90	33.08	.00	.355
	Social Norms & Curtailment (Nudge type 1 & 2)	471.629	1	471.63	130.04	.00	.684

a. R Squared = ,597 (Adjusted R Squared = ,590)
b. R Squared = ,355 (Adjusted R Squared = ,345)
c. R Squared = ,684 (Adjusted R Squared = ,679)

Findings

This research emphasizes the concept of 'Nudge' through the use of architectural options for energy efficiency. This concept is widely used by many countries. Our initial hypothesis is that urban society as energy consumers tend to agree with public opinion and hear what they have to say. A group of people in a rural environment may have the same similarity so that the government or authority can draw the same conclusion. Likewise, the behavior of receiving energy efficiency products and energy conservation, public opinion or social norms with general behavior will certainly be more dominant. The 'Nudge' that pushes for energy conservation or energy efficiency is new and is becoming a trend and is widely practiced by many governments. In energy efficiency projects, the relevant Ministries can work together with district governments to display energy savings in more prominent media and make them more visually attractive to the public. The idea of 'Nudge' can be used to frame incentives for

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the wider community. The 'Nudge' idea to reduce energy consumption could result in many energy-saving projects and reduce carbon emissions in the future (Thaler & Sunstein, 2003).

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