Indonesian Journal of Electrical Engineering and Informatics (IJEEI)
Vol. 11, No. 3, September 2023, pp. 911~922
ISSN: 2089-3272, DOI: 10.52549/ijeei.v11i3.4885

The Success Factors in Measuring the Millennial Generation's Energy-Saving Behavior Toward the Smart Campus

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Article Info

Article history:

Received Jun 21, 2023
Revised Sep 17, 2023
Accepted Sep 28, 2023

Keyword:

Energy-saving Behavior
Fuzzy analytical hierarchy process
Millennial generation
Smart Campus
Decision support system

ABSTRACT

The millennial generation has a pivotal role in leading the industrial digital revolution. Energy-saving behavior and millennials' awareness of energy consumption for educational context become crucial in performing a smart campus. This study tries to identify the success factors in measuring the millennial generation's energy-saving Behavior toward the smart campus. The measurement model considers two significant constructs, including energy-saving attitudes with energy-saving education (organizational saving climate); energy-saving education and environment knowledge (personal saving climate); and energy-saving information publicity as sub-indicators, and construct energy-saving Behavior viz sub-indicators Behavior regarding energy and behavior control. In order to determine the preference level of each indicator and sub-indicator, the Fuzzy Analytical Hierarchy Process (Fuzzy-AHP) approach was executed by disseminating the questionnaire to 100 respondents from energy practitioners, students, and academicians in Indonesia. The calculation reveals that the energy-saving behavior construct has a higher priority value (0.94) than the energy-saving attitude (0.06). Meanwhile, energy-saving education and environment knowledge (personal saving climate) have been analyzed at the cutting-edge sub-indicator, followed by energy-saving information publicity and education (organizational saving climate). In addition, the sub-indicator for behaviors regarding energy becomes more demanding compared to behavioral control. As a novelty, the priority analysis of this Model aids the management of the campus and government in developing smart campus policies and governance. This Model can be used as a guideline for the management level to execute the smart campus practices. Thus, the effectiveness and optimization of smart campus transformation can be cultivated and accelerated. Besides, the potential coming of risks can be avoidable.

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1. INTRODUCTION

Energy is essential for economic and social development and improving the quality of life in all countries and regions [1]. Currently, the most significant energy consumption comes from conventional or non-renewable sources [2][3], including building operations as one of the largest energy consumers worldwide. The potential for energy savings in building operations is tremendous due to the widespread equipment degradation, errors in system components, and lack of control strategies in buildings [4].

Energy-saving Behavior in society is influenced by internal factors such as awareness and knowledge about energy saving [5], whereby this knowledge implicates an indirect impact on residents' intentions to save energy [6]. Knowledge and energy-saving Behavior have a significant relationship [7]. Residents with more information and knowledge about energy saving will be more likely to participate in energy-efficient activities in their daily lives [8]. In addition, publishing information and knowledge related to energy saving through various media can increase the environmental awareness of the population [9] and induce the development of energy-saving circumstances.

Most of the previous research has focused on citizens' energy-saving Behavior. Unfortunately, it found a need for more systematic research on energy-saving Behavior and student awareness. In contrast, students in the millennial generation comprise a third of the population in Indonesia. Therefore, the position of this generation is strong and authoritative in determining the economy, business, and workforce in supporting the formation of the Industrial Revolution [10]. The millennial generation has ambitious characteristics, global thinking, entrepreneurial and independence, accepts diversity, extreme creativity and work flexibility, and understanding and uses technology and the internet on large-scale activities [11]. As millennials, students provide significant energy consumption needs and advanced consumption concepts. Thus, understanding the energy-saving characteristics of students will contribute to the potential reference in predicting the energy-saving awareness of future residents [12].

Students' energy consumption is determined by energy-saving awareness and other factors. To reduce energy consumption, understanding the correlation between energy-saving awareness and other factors is the basis for exploring the formation of individual energy-saving Behavior [3]. Several studies have identified factors influencing the students' energy use behavior and awareness. For example, ethics, various incentives and barriers, energy-saving awareness and attitude, and regulations and policies are significant influencing factors [13][14]. Energy-saving Behavior is also closely related to environmental attitudes, social norms, and social influences [15]. According to [16], incompetence, reluctance, and social problems are significant barriers to individual energy-saving Behavior [16]. Therefore, a systematic investigation of the role of energy-saving Behavior in the context of the millennial students' awareness in universities as the most significant contributor to energy use still needs to be studied further [17].

As a digital generation, university students demand substantial energy consumption needs through specific usage patterns, especially in the learning process or other activities. The understanding of energy-saving Behavior and awareness of the millennial generation will be reflected in environmental attitudes regarding social norms and social influences on the realization of smart governance in universities [10] and population [18]. Thus, students' consumption behavior impacts families, society, and the state [19]. Understanding the students' energy-saving Behavior is the key to building a "two-oriented society," namely an efficient and environmentally friendly society [18].

The Industrial Revolution 4.0, the proliferation of COVID-19, and the post-pandemic need for socio-economic digital transformation, including the establishment of Smart Campus, are the solutions for digital education improvement. The development of Smart Campus aims to develop integrated, intelligent, and real-time data and information application services, both in the learning and interaction management process. Herein, the smart university governance needs to explore the potential innovative information and communication technology (ICT) and intelligent energy management buildings and infrastructures as well as control heating, ventilation, and air conditioning (HVAC-heating, ventilation, and Air Conditioner), lighting, and the appropriate utilization of infrastructure, energy saving activities, dynamic environment, and flexible according to user needs [20]. Recent studies have shown that a comfortable educational environment, such as air quality, temperature, or noise, brings successful learning and society evolution [21]. In a nutshell, measuring the external parameters of the Smart Campus-based educational environment that significantly impacts sustainability, energy efficiency, student learning, and teaching performance develops into the central issue in this study.

Decision support systems (DSS) with Multi Attribute Decision Making (MADM) approaches have been performing sophisticated analysis for performance measurement in many field areas, including MADM-DEMATEL for identifying the circularity impediments in the aluminum industry [63], Multi-Criteria Decision-Making Fuzzy TOPSIS for Solar Energy Implementation [64], AHP approach for Evaluating the Productivity of Engineering Departments at a Public University [65], PROMETHEE for Evaluation of brain cancer treatment techniques [66], and TOPSIS, and VIKOR multi-criteria decision-making for Financial performance evaluation [67]. Nevertheless, the reviews found the potential exploration of Fuzzy-AHP compared to other MADM methods for performance measurement due to the efficacy of this approach in handling uncertainty and imprecision of decision-making problems that is a suitable tool for performance measurement which consists of un-precise data [68]. Fuzzy-AHP considers the integratif approach of qualitative and quantitative thus allowing a comprehensive analysis of performance measurement problems [69]. Moreover, the Fuzzy-AHP Decision support system (DSS) approach has a high intensity in suppressing the ambiguity of assessment weight, linguistic problems, human thinking styles, as well as the sensitivity of the decision makers' analysis [22][23][24][25]. Thus, the Fuzzy-AHP DSS approach is reliable and commonly used in dealing with the decision makers' satisfaction, multiple criteria decision-making analysis and problem-solving, level of significance, and hierarchical problems of performance indicators and assessment [26][27][28]. Reviewing this approach's advantages, the proposed energy-saving measurement model adopts the Fuzzy-AHP DSS in identifying the significant contributions of constructs and sub-indicators of the Model. Understanding the values of this Model can guide university stakeholders in managing the governance of a university toward a smart campus.

2. RESEARCH METHOD

2.1. Construct Development-Energy Saving Attitudes and Behavior

This study uses variables or criteria that serve as the basis for building a measurement model based on DSS to identify the energy-saving Behavior of students. The adopted variables or criteria for energy-saving attitudes are described by assessing energy-saving education (organizational saving climate), energy-saving education and environment knowledge (personal saving climate), and energy-saving information publicity. Meanwhile, the energy-saving behavior criteria identify Behavior regarding energy and behavioral control.

Table 1. Definition of terms for model development

No	Constructs/Sub Variables	Definition
1	Energy Saving Attitudes	Attitude towards energy saving [40] [41].
2	Energy-saving education (Organizational saving climate)	The perspective of an energy-saving climate in organizations/ institutions/ universities captures education in energy saving. It relates to how universities/agencies perceive and encourage the formation of energy-saving values and commitments to the energy-saving process [29].
3	Energy-saving education and environmental knowledge (Personal saving climate)	Environmental education and knowledge in energy saving from a personal climate perspective. This relates to personal participation in energy-saving activities, knowledge and personal responsibility of the negative consequences of using electricity, the right knowledge approach to energy saving, energy problems in society, social changes that must be made to protect the environment, and laws and regulations. Energy and environmental protection. [30] [36] [37].
4	Energy-saving information publicity	Publication of information related to energy saving. This is related to personal Behavior in promoting energy-saving publications, the existence of sources of information and its dissemination through newspapers, television, or other media that affect Behavior in energy-saving, and the role of family and colleagues in energy-saving information [42].
5	Energy-Saving Behaviors	Behavior related to energy saving [40][41][60].
6	Behaviors regarding energy	Behavior in energy saving, such as choosing to walk or bike instead of taking a car, prioritizing environmentally friendly products that save energy, energy saving Behavior such as turning off electrical appliances when not in use, saving water, electricity, and paper [30] [33].
7	Behavioral control	Behavioral control is related to efforts to reduce global climate change, buy products, equipment, and packaging that are energy efficient and cause the least pollution, and convince the environment and society (family and friends) to buy and use environmentally safe products. [36] [41]

Variable energy-saving education (organizational saving climate) is paramount in shaping the members' perceptions and Behavior. These perceptions and Behaviors refer to organizational practices and procedures [29]. For example, the climate in the organization requires members to conduct the safe utilization of electricity, thus providing an effect on the compliance of energy safety [30]. In addition, the role of the variables, viz. energy-saving education and environment knowledge (personal saving climate), generally describes the facts of knowledge in the field, concepts, or relationships to the environment and the surrounding ecosystem [31]. Several activities related to energy-saving education and environmental knowledge (personal saving climate) variables, including the student's participation in energy-saving activities caring for the environment [32].

However, the execution of this energy-saving habit found several obstacles due to a need for more knowledge and skills, which include information disclosure and education. Therefore, many researchers believe that the variable energy-saving information publicity hands over on the habits and alertness impacts [30]. The behaviors regarding energy are construed [31] by several activities such as storage, consumption, interest, and utilization, for example, students' habits of turning off lights when not in use, reducing fire, saving water, and avoiding charging their phones overnight.

Several habit constructions are under public personal control regarding convenience or social interaction and difficulties on the floor [33]. According to [34] and [35], perceived behavioral control influences the provision used within the organizational environment [34][35].

Attitude portrays a positive and negative appraisal of Behavior. [36] reported that attitude, instead of subjective norms, perceived behavioral control, and personal moral norms, grow into the paramount factor in influencing the purchase intention of energy-efficient equipment by considering the smoke pollution and environmental impacts [36-39]. The discussion above shows the strong attitude impact on behavioral intentions and favorable attitudes, thus encouraging improving behavioral intentions toward energy-saving behavior [40].

[41] proposed a new energy-saving behavior model whereby the normative processes influence the intention to save energy and energy habits and habit processes, and objective and subjective controls to save energy. This study explained that energy-saving Behavior is associated with the habit's inclusion and perceived and objective control that significantly predicts Behavior [41].

Referring to literature reviews, the definitions of contract and the sub-variables of this study are explained in Table 1.

2.2. The Fuzzy-AHP

The Analytical Hierarchy Process (AHP) model is a popular and successful Multi-Attribute Decision Making (MADM) technique for determining the significant criteria values in project assessment. One outstanding AHP can solve complex and unstructured problems in the hierarchy criteria and sub-criteria levels [43]. AHP can tolerate decision-makers' assessments and diverse views when dealing with multiple criterion decision-making situations. [44] have successfully identified the Balanced Scorecard (BSC) weighted variables using AHP and their significant contribution values in measuring the achievement of organizational performance [44]. Meanwhile, [45] used AHP in conjunction with the Analytical Network Process (ANP) to successfully establish the weights of criteria for the manufacturing operation management model [45]. This approach was utilized to analyze the gaps and disparities among decision-makers at designated points. AHP escalates the decision-makers viewpoints into 1 to 9 degrees as given preferences against alternatives preferred. The consistency of the comparison matrices reflects the decision-maker's caution in launching unfinished judgments and affects the acceptably persistent indicators [46]. Herein, Fuzzy-AHP was introduced to cope with the fuzziness and uncertainty judgments of decision-makers through the fuzzy set numbers operation [46][26][22]. Therefore, the vagueness of human thoughts, human thinking style, and linguistic terms was sufficiently handled by integrating the fuzzy approach in AHP [24]. [47] utilized F-AHP to spell out the different perceptions of decision-makers language and variables understanding into triangular fuzzy for solving the manufacturing performance assessment. [27] employed F-AHP to establish a consistent judgment matrix in a new consulting process toward an adequate risk assessment model [27]. Meanwhile, [23] brought to bear the fuzzy-AHP-based decision support system approach to determining the priority indicators in appraising SMEs' digitalization readiness [23]. Following [48], the flow activity of Fuzzy-AHP is explained below [48].

Table 2. Fuzzy conversion scale

Scale	TFN Scale	TFN Inverse Scale
1	(1,1,1)	(1,1,1)
2	(1/2, 1, 3/2)	(2/3, 1, 2)
3	(1,3/2, 2)	(1/2, 2/3, 1)
4	(3/2, 2, 5/2)	(2/5, ½, 2/3)
5	(2, 5/2,3)	(1/3, 2/5, 1/2)
6	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)
7	(3,7/2, 4)	(1/4, 2/7, 1/3)
8	(7/2, 4, 9/2)	(2/9, ¼, 2/7)
9	(4, 9/2, 9/2)	(2/9, 2/9, ¼)

The analysis starts with the structure hierarchy development of the millennial generations of energy-saving Behavior toward the smart campus model (Figure 1). The hierarchy showed the model construction of variables and sub-variables categorization set as criteria. Hence, the Fuzzy-AHP analytical was operated in order to verify the model construction over the pairwise matrix comparison values, including the Consistent ratio (CR), Consistency Index (CI), and Random Index (RI). Herein, the Fuzzy transformation was an oversight by following the Triangular Fuzzy Number (TFN) scale as depicted in Table II [49]. TFN is a trapezoidal fuzzy number that provides a linear mathematical model conversion using l, m, and u parameters (l≤m≤u) for weighting the fuzzy function of criteria and alternatives. Thus, the fuzzy numbers can be handed over and considered the significant operation to achieve the optimum ranking results [50][51].

Next, the calculation of Fuzzy Synthesis (Si) values was assisted by the formula in Equation (1).

$$Si = \sum_{j=1}^{m} M_{gi}^{j} \, x [\sum_{i=1}^{n} \sum_{j=1}^{m} M_{gi}^{j}]^{-1} \quad (1)$$

Si extent value is determined by considering the synthetic values from the total amount of criteria *(m)* transformation values within TFN scale (*M*) that are described in the (*g*) parameter as *(l, m, u)* against the pairwise matrix in rows *(i)* and column *(j)* comparison. Based on the synthesis extent values, the calculation of vector value *(V)* is defined in $M_2 = (l_2, m_2, u_2) \geq M_1 = (l_1, m_1, u_1)$ whereby $V (M_2 \geq M_1) = sup[min(\pi M_1(x)), min(\pi M_2(y))]$ and

$$V(M_2 \geq M_1)=\begin{cases} 1 if m_2 \geq m_1 \\ 0 if l_1 \geq u_2 \\ \frac{l_1-u_2}{(m_2-u_2)-(m_1-l_1)} \end{cases} \quad (2)$$

This value represents the relative preference or weight of one criterion over others. The calculation of De-fuzzification Ordinary Value (*d'*) for criteria numbers *(k)* = 1,2, n; k ≠ I, the vector weight *(W)* value for each alternative (*A*) is calculated using the formula at Equation (3) *W '= (d' (A1), d' (A2),….. d' (An))*^{T}. Then, the normalization value of fuzzy vector weights (*W*) estimation is estimated using the formula at Equation (4) $d(A_n) = \frac{d'}{\sum_{i=1}^{n} d(A_n)}$, whereby $W = (d(A_1), d(A_2),…,d(An))^T$ and *W* is a non-fuzzy number.

2.3. Methodology

The initial steps taken in measuring the energy-saving Behavior of the millennium generation toward smart governance is by identifying phenomena, significant issues, and problems that are carried out both theoretically and through surveys through the distribution of questionnaires. Theoretically, the basic scientific concepts adopted by this paper are Energy-Saving and energy-saving Behavior obtained through books, theses, proceedings, or journals. In this case, a systematic literature review is carried out with the limitations of journals and conference papers under the Scopus and Google Scholar index (2011-2022). As an outcome, a construction development as the instrument was performed to measure the energy-saving Behavior of the millennium generation towards smart governance. Furthermore, the Fuzzy-AHP questionnaire with 1 to 9 scales of [52 and 61] was distributed to 100 respondents, including practitioners, students, and academicians, to get the constructs' assessment, which will later help find the priority value of each construct. The Fuzzy-AHP questionnaire asked the respondent qualitatively and quantitatively to evaluate the significant scale of one variable that hierarchy structurally against the others. This questionnaire adopted the Fuzzy-AHP conceptual approach. Herein, the qualification of respondents is limited to the expertise with practical and academically background on energy saving and campus top management level in Riau Province. Moreover, the respondent from the students' side of the Faculty of Science and Technology, Universitas Islam Sultan Syarif Kasim Riau, contributes the general views of the millennial generation in describing the campus energy-saving environment and society. Finally, the expert judgment was conducted in the forms of a Focus Group Discussion in order to validate the questionnaires' findings and resume.

Based on the information collection and reviews from various reading resources, it was found that two main criteria, namely energy-saving attitude and energy-saving Behavior, are the most frequently mentioned words in determining the measurement model. It then discusses that the energy-saving attitude provides three sub-indicators: energy-saving education, energy-saving education and environment knowledge, and energy-saving information publicity. Meanwhile, two sub-indicators constructed energy-saving Behavior, including Behavior regarding energy and behavior control. In order to test the efficacy of this Model, a Decision Support System (DSS) approach using Fuzzy-AHP processing for Multi Attributes Decision Making (MADM) analysis was performed through the development and deliberation of the instrument using the Saaty questionnaire with an importance scale of 1-9 [52][61]. The application of the DSS Fuzzy-AHP concept is adopted effectively in this questionnaire to accommodate the diversity of perspectives in translating information, both data and linguistic issues [24][25]. As a result, the priority value analysis of each criterion and sub-criteria is ranked and enriched in the measurement model [53] [54].

3. RESULTS AND DISCUSSION

Following the fuzzy-AHP stages in methodology, a model analysis with the priority weight value is described below.

3.1. Analysis of Construct Interest with Fuzzy-AHP

The initial stage of construct interest analysis is carried out by developing a hierarchical structure of the millennium generation energy-saving behavior model towards a smart campus. Herein, the structural hierarchy for the constructs, indicators, and sub-indicators is described in Figure 1.

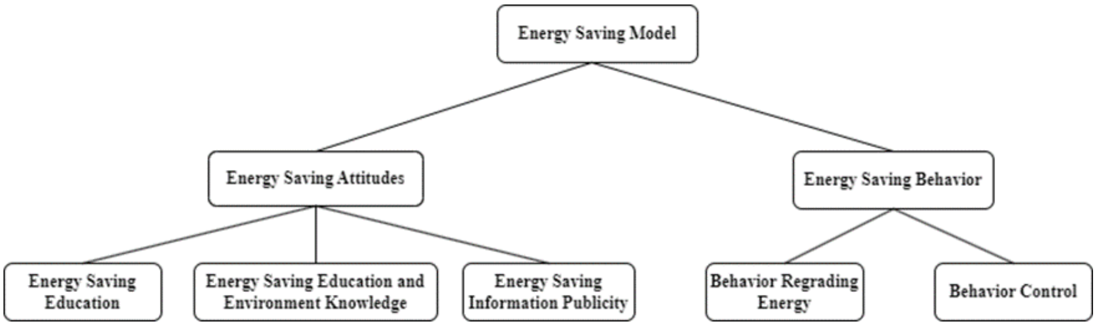

Figure 1. The hierarchical structure of the Millennium Generation energy-saving behavior model

Next, the calculation analysis for AHP and comparison matrix amongst indicators and sub-indicators thus defines the values of CI, CR, and RI are shown in Table 3.
Table 3. The AHP comparison matrix calculation

Table 3. The AHP comparison matrix calculation

No	Criteria/Sub-Indicators	Vector Eigenvalues	CI	CR	RI	*λmaks*
1	Energy-Saving Attitudes	0,38	-1,50	~	0,00	0,50
1.1	Energy-Saving Education (Organizational Saving Climate)	0.26				
1.2	Energy-Saving Education and Environment Knowledge (Personal Saving Climate)	0.47	-0.12	-0.21	0.58	2.75
1.3	Energy Saving Information Publicity	0.28				
2	Energy-Saving Behaviors	0,62	-1,50	~	0,00	0,50
2.1	Behaviors Regarding Energy	0,44	-0.50	~	0,00	0,50
2.2	Behavioral Control	0,56				

Following Equations (1) to (4) at the research method, the weighting calculation of Fuzzy-AHP analysis is collected as in Table 4. Herein, the values of fuzzy synthesis for each construct and sub-criteria are determined in the low, middle, and high fuzzy mapping schema. Meanwhile, the recapitulation of the model calculation is then performed in Table 5. Table 5 indicates that the effectiveness of the energy-saving behavior measurement model is determined mainly by the energy-saving behaviors construct with a fuzzy scoring weight of 0.94 as well as on the sub-indicator behavior regarding energy at 0.52 and behavior control at 0.48, respectively. Meanwhile, the energy-saving attitudes construct is strongly influenced by the sub-indicators of energy-saving education and environment knowledge (personal saving climate), followed by the energy-saving information publicity and energy-saving education (organizational saving climate) with fuzzy weight values of 0.52, 0.24, and 0.24, respectively.

Table 4. The Fuzzy-AHP vector analysis

No	Criteria	Fuzzy Synthesis (Si)			Fuzzy Vector Weights (W)
		L1	M1	U1	
1	Energy-Saving Attitudes	1,59	1,73	1,91	0,06
1.1	Energy-Saving Education (Organizational Saving Climate)	2,35	2,71	3,20	0,24
1.2	Energy-Saving Education and Environment Knowledge (Personal Saving Climate)	3,20	3,83	4,52	0,52
1.3	Energy Saving Information Publicity	2,37	2,74	3,23	0,24
2	Energy-Saving Behaviors	2,10	2,38	2,70	0,94
2.1	Behaviors Regarding Energy	1,76	1,95	2,22	0,52
2.2	Behavioral Control	1,82	2,06	2,31	0,48

Table 5. The recapitulation of model vector analysis

No	Criteria	Vector Eigenvalues	Sub-Indicators	Vector Eigenvalues
1	Energy-Saving Attitudes	0,06	1.1. Energy-Saving Education (Organizational Saving Climate)	0.24
			1.2. Energy-Saving Education and Environment Knowledge (Personal Saving Climate)	0.52
			1.3. Energy Saving Information Publicity	0.24
2	Energy-Saving Behaviors	0.94	2.1. Behaviors Regarding Energy	0.52
			2.2. Behavioral Control	0.48

3.2. Analysis of Construct Interest based on Respondents' Perceives

The mapping values calculation analysis based on the respondents' answers is defined in Table 6. This table shows no significant differences among students, academicians, and practitioners in determining the measurement of energy-saving Behavior towards the smart campus, whereby the Energy-Saving Behaviors construct contributes as the most considered variables in performing the smart campus instead of Energy-Saving Attitudes. Moreover, students and academicians agree that Behavior Control provides more substantial energy-saving values than others.

Table 6. The Respondents' Perceives on Model

No	Criteria/Sub-Indicators	Priority Values		
		Students	Academician	Practitioners
1.	Energy-Saving Attitudes	0.466	0.390	0.060
	Energy-Saving Education (Organizational Saving Climate)	0.295	0.192	0.237
	Energy-Saving Education and Environment Knowledge (Personal Saving Climate)	0.411	0.581	0.520
	Energy Saving Information Publicity	0.294	0.227	0.243
2.	Energy-Saving Behaviors	0.534	0.610	0.940
	Behaviors Regarding Energy	0.454	0.285	0.520
	Behavioral Control	0.546	0.715	0.480

3.3. Discussion

The model analysis successfully generates significant contributions and correlations amongst the constructs and sub-variables in determining the model development. The analysis reveals that the energy-saving Behavior of the millennial generation in their daily life activities is devoted to the environmental attitudes, social norms, and social influences on the success of smart campus transformation. For example, the student prefers to ride a bicycle instead of riding a motor vehicle, giving priority to products that are environmentally friendly and save energy in shopping, effective in energy utilization such as turning off the TV after watching, turning off computers, lights, air conditioners, or other electrical equipment's after using them, avoid charging mobile phones overnight, and feeling guilty if the application does not save water, electricity, or paper. Likewise, the automatic linear behavior control with energy-saving Behavior tends to raise the millennial generation's awareness of being responsible for the damage and negative impacts from energy misapplication personally, families, communities, and the surrounding environment [10]. Meanwhile, the energy-saving attitudes of the millennial generation are sturdily affected by sub-indicator energy-saving education and environment knowledge (personal saving climate). It regards how millennial generations participate in energy-saving activities, explore information about negative consequences, local ecological damage, and global warming, and explore the best tips and methods of knowledge sharing for saving energy in everyday life. They are also responsible for the enormous social changes needed to protect the natural environment and to encourage the government, society, individuals, and every family to save energy, starting from the campus environment [55]. In order to further socialize and publish the information and energy-saving culture, the support of the government and higher education institutions reflects their intense consideration of these issues [56]. Subsequently, the millennial generation, together with the government and campus, create and develop ideas for empowering energy-efficient technology and infrastructure for smart campuses [57] through the adoption of the Internet of Things (IoT) technology [58], solar photovoltaic energy [59], the google glass adoption teachers and learners' technology [60], wireless power transfer technology [61], and the augmented reality technology as welding simulator in engineering training [62]. This Model has successfully identified how the students, academicians, and practitioners comprehend the significant constructs and sub-indicators proposed in the Model. This Model reveals that Behavior Control in the millennial generation during their campus day life activity, such as controlling their consuming priority equipment on safe energy products [34], delivers more significant values than Behavior in energy saving. [40] observed that subjective norms, perceived behavioral control, and moral norms substantially impacted students' intentions to engage in energy-saving actions and habitual processes in performing the energy-saving behaviors. Furthermore, social and personal norms influence environmental situations and addictive behaviors, thus impacting energy-saving practices [41]. In a nutshell, this Model, with priority constructs and sub-indicators analysis, provides policy guidelines for the campus' stakeholders to achieve smart campus success in energy savings. The guidelines are to reduce energy consumption, promote energy efficiency, and integrate smart technologies to optimize energy management.

4. CONCLUSION

Energy savings direction is doubtless decisive in assisting economic and social development and improving the quality of life in the community. Various efforts have been conducted to spread energy-saving awareness, knowledge, and consideration, including developing a measurement energy-saving model for a campus environment involving students, academicians, and practitioners towards the smart campus. As the millennial generation of the most significant energy users on the campus, students grow into the main targets in encouraging the formation of an energy-saving culture, Behavior, and attitude toward the effectiveness of an innovative campus. This Model employs the Fuzzy-AHP approach that has succeeded in identifying two primary constructs in measuring the millennial generation's energy-saving Behavior and attitudes. As a result, the behaviors regarding energy and behavior control develop into a significant construct and sub-variable as well as main contributors in influencing the millennials' energy-saving Behavior. Therefore, the various efforts and activities, education, publication, and information acquisition and sharing, must touch down the young generation's daily life, especially during the campus environment. Various technologies and infrastructure need to be continuously developed to support the optimum and effectiveness of smart campus achievements, including through the development of augmented reality technology, data mining, Google Class, cloud computing, smartphones, iCampus, web services, IoT, Artificial intelligent, RFID, Blockchain, Big data, robotics, security solutions, and geospatial solutions.

By understanding the significant weighted values of each contract and variable in this Model, the measurement of energy-saving Behavior for millennials can be identified and directed to achieve smart campus success. Moreover, this Model provides guidelines for the government and institution managers in socializing, exploring the potential innovative smart buildings and infrastructures, and creating the supported policy to enhance environment energy-saving behavior. As the millennial generation's spearhead, students significantly contribute to achieving successful energy saving in the campus, community, and environment. Unfortunately, these findings are limited to the scope of the millennial generation from the campus site. For future work, this Model can be enhanced for a broader environment and society by deeply exploring constructs in energy-saving behaviors. The application of this Model in measuring the energy saving Behavior of the millennial generation provides the figures of smart campus readiness in terms of infrastructure, finances, culture, and education toward success.

ACKNOWLEDGMENTS

The authors would like to thank Lembaga Penelitian dan Pengabdian Masyarakat Universitas Islam Negeri Sultan Syarif Kasim Riau, No. 0684/R/2022, for funding and support for this research.

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