

The Third Information Systems International Conference

Investigating the Behavior of Citizens to Use ICT in Environmental Impact Assessment (EIA)

Reny Nadlifatin^{a*}, Shu Chiang Lin^a, Satria Fadil Persada^a, Mohammad Razif^b

^a*Department of Industrial Management, National Taiwan University of Science and Technology, 43 Keelung Road, Section 4, Taipei 106, Taiwan, ROC*

^b*Department of Environmental Engineering, Institut Teknologi Sepuluh Nopember (ITS), Campus ITS Sukolilo, Surabaya 60111, Indonesia*

Abstract

In this paper, the study investigates the behavior of citizens in using information and communication technologies (ICT) in environmental impact assessment (EIA) involvement. Perceived government support, attitude, and perceived behavior control are measured as a predictor model of citizens' behavior intention. The result reveals that 51 percent of citizens' intention is well described by the assessment model. The result also reveals the perceived behavior control as a key factor to the involvement intention. This result can be used as a consideration by EIA policy makers and project owner to develop strategies in involving citizens with ICT.

© 2015 Published by ISICO

Keywords : Citizens; Information and communication technologies; Environmental impact assessment; Behavior intention

1. Introduction

In this research study, an exploration of ICT in a government environmental program, namely environmental impact assessment (EIA), will be measured to depict the citizens' ICT based involvement in EIA. While many studies intensively explored the use of ICT in EIA based on quantitative assessment, few focused on qualitative assessment, especially on the behavior point of view. This research, hence, provides a new point of view by examining the citizens' behavior to participate in EIA with ICT and the highlighted technologies are related to internet-based and SMS. An evaluation model is developed and three factors, namely perceived government support, attitude and perceived behavior control are used as a predictor of citizens' behavior intention. The target of this research is to understand whether the intention to participate in EIA with ICT largely contribute by the attitude or the perceived behavior control through the structural equation modeling analysis (SEM). Understanding the citizens' intention is important, which can help both EIA-related agencies and project owner to conduct further strategies through the

* Corresponding author. Tel.: +886-2-2737-6330; fax: +886-2-2737-6344.
E-mail address: d10201806@mail.ntust.edu.tw.

behavioral encouragement that can increase citizens' intention level. Increasing citizens' intention to participate in the EIA process with ICT will help EIA-related agencies and project owner to determine the number of citizens' involvement and gather precise data used for EIA analysis as well as to produce the accurate recommendations and policies in the EIA result.

2. Literature review

2.1. Environmental impact assessment (EIA) in Indonesia

EIA program in Indonesia was firstly legalized in the year 1999 by the Government of Indonesia [1]. The regulation of how the citizens can participate, a year later, was endorsed by the head of Indonesia's environmental management agency and was amended in the recent year 2012. The chances of citizens in many phases are provided in current regulation more than the previous regulation by the government in the EIA process [2]. In the present regulation, particularly for electronic media descriptions, Ministry of Environment of Indonesia explicitly mentions the variety of technologies that can be used by the project owner to announce the proposed project, namely website, social network, SMS and any usable media as the additions of television and radio. It can be indirectly said that the ministry, through the regulation, recognize the evolution of the information and communication technologies and consider them as one of the channels in the EIA process. For the suggestions, opinions and feedbacks (SOF), although the regulation does not clearly mention about the detail of the technology that can be used for delivering SOF, the citizens can use the ICT media that is written or recorded. Similarly, although it is not mentioned about the detail technology in the public consultation, both project owner and citizens can use any bidirectional communication channel. In summing up, the new regulation explicitly and implicitly allows the use of written or recorded technologies that can facilitate both one directional and bidirectional communication.

2.2. The role of perceived government support

As previously described, the procedures to participate in the EIA activities are regulated by the Government of Indonesia. Thus, the Government is in the position to support or hamper the activity that might harm the environment, especially for living creatures in terms of physical, social, cultural, biological, economic, and health. Past research studies [3, 4] mention how the force and intervention from the government can help the realization of the ICT adoption as well as ICT based service implementation respectively. Hence, it can be said that perceived government support (PGS) is an individual perception that any support and permit given by the government are considered to be able to accommodate the individual to perform a specific behavior [5]. The government can provide the support to project owner by endorsing the environmental permit if the project development was validated as environmental friendly. At the same time, if the activity will possibly harm the environment surrounding, the government can protect it by declining the environmental permit of project activity. In terms of technology support, the government was previously endorsed a regulation regarding the validity of ICT transaction [6]. In general, any technologies outside the website, social network, and SMS that is recorded or written digitally can also be used as an ICT medium in the EIA process.

2.3. The dominant factor between attitude and perceived behavior control

Attitude (A) is the favorable or unfavorable feeling of someone to conduct a certain behavior [7]. Behavior intention (BI) is a reflection of the individual to perform certain action [8]. Attitude is recognized in many behavioral researches as an essential factor that could improve the individual's BI in

performing certain activity [8, 9]. In EIA process, it is important to attract the citizens' favorable feeling to participate in the EIA assessment. The involvement of citizens will help the project owner to collect the precise data in the field and to provide the accurate analysis that can help the environmental sustainability. Likewise, it is essential to provide every aspect of communication channel, including the favorable conditions of using ICT. In the announcement stage, citizens are allowed to deliver their SOF with written or recordable ICT media. At the public consultation stage, both project owner and citizens can also use bidirectional communication technologies such as teleconferencing or digital forum. These ICT channels are expected to stimulate the citizens' perceived to favor the involvement in the EIA process. Thus, by hypothesize the positive correlation of the perceived government support to citizens' attitude and attitude to citizens' behavior intention with ICT involvement, this research proposed the following hypotheses:

H1: PGS is positively related to A of citizens to participate with ICT in EIA process.

H2: A is positively related to BI of citizens to participate with ICT in EIA process.

Perceived behavior control (PBC) is the degree of individual feeling about the resources and opportunities that the person has to conduct a specific behavior [7]. Past behavior studies have validated the indispensable of PBC in describing individual behavior [7, 9]. Resource of PBC in this research can be interpreted as the any facility and knowledge that the citizens have as the internal control. In more detail, the example of resource can be seen as how the citizens own some ICT and how familiar them with the use of ICT as a channel to perform the communication in EIA stages. Such studies conducted by Wahid [10] and Nugroho [11] show how the internet is explored to be a promised media for Indonesian people. Another research study conducted by Persada, et al. [12] shows how SMS can conveniently able to facilitate the citizens' aspiration for EIA process. For the opportunities of PBC, the government provides the wide space for citizens to discuss about the environmental impact in many stages. The government also suggests the project owner to adjust the communication based on the citizens' preferences, including the use of ICT as a medium. It can be said that the citizens own the special attention to EIA process. Thus, considering the role of PBC to use ICT in helping the communication channel between citizens, EIA-related agencies and project owner, this research proposed the following hypotheses:

H3: PGS is positively related to the PBC of citizens to participate with ICT in EIA process.

H4: PBC is positively related to the BI of citizens to participate with ICT in EIA process.

3. Methodology

This study develops a behavioral assessment model and a questionnaire is made as the instrument for collecting the data. The questionnaire contains of two parts, which the first part asks about 11 observed variables that are aimed to measure 4 latent variables in the assessment model. The second part asks about demographic and background information of the respondents such as their place of origin and age. The 11 observed variables, which include PGS, A, PBC and BI, are measured by a five-point Likert scale that ranges from 1 as "I strongly disagree" to 5 as "I strongly agree". The 150 questionnaires were distributed and 120 were responded in a span of three months from January 2014 to April 2014. Both digital and paper based questionnaires were performed to collect the data from the citizens who have the experience in the EIA process. The study considers that the experienced respondents were able to describe the behavior intention of the EIA process. The respondents' data was collected from several projects and discussion surveys, where 104 were from western region, 12 were from the central region, and 4 were from the eastern region. Due to some limitation of time and resource, this research only captures the majority of respondents from the western region. However, the ratio of 120 respondent number from different places of origin represents approximately the relative ratio of ongoing development activities

among the region during the survey time was conducted. A total of 120, involving ages from 21 to 61 years old, participated in this study.

To ensure the data can be used for analysis, the reliability and convergent validity of each observed variable are measured. This research uses some parameters, namely factor loadings (FL), Cronbach α (α), composite reliability (CR), and the average variance extracted (AVE). In more detail, each parameter should surpass the minimum value of equal and more than 0.7 for FL, α , and CR. A minimum value of equal and more than 0.5 for AVE is required to justify the convergent and discriminant validity [5]. After the convergent and discriminant validity are performed to check the data robustness, a model fit assessment was performed. Several parameters suggested by Hooper, et al. [13] such as the goodness of fit (GFI), normed fit index (NFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), and root mean square residual (RMR) will be used as the model fit assessment test. A minimum value of equal or more than 0.9 are required for GFI, NFI, and CFI. A maximum values of equal or less than 0.08 are needed for RMSEA and RMR.

4. Result

The 120 collected data were identified to have a dominant value of neutral to agree (the averages are between 3.41 to 4.19) as shown in Table 1, which indicates most of the respondents show the neutral and positive response to most of the observed variables. The value of FL, α , and CR in Table 1 are all above 0.7 as well as the value of the AVE are all above 0.5. Hence, the reliability and convergent validity of the data are statistically satisfied. The following assessment was to determine the model fit and to validate the proposed hypothesis. As it can be seen in Table 2, the result value of five indicators is fulfilled the required value. Thus, the evaluated model is considered as robust and predictive. The next assessment was by conducting a SEM analysis, where multiple correlation analysis to interpret the causal relationship between factors was conducted and the result is shown on Table 3. The result of direct and indirect correlation hence validated all the proposed hypotheses to have the significant positive correlation. Among the two factors that have direct correlations to behavior intention (BI), the correlation of perceived behavior control (PBC) was explored to have a dominant factor to citizens' BI. PBC was also explored as the strongest correlation among the evaluated factors. A squared multiple correlation (SMC) value was also explored as a representation of R-square in the evaluation model. R-square of BI in this study has reached 51% ($R^2 = .51$). The evaluation model is well supported and BI represents the citizens' BI to participate in the EIA with ICT appropriately.

5. Conclusion

Public involvement is essential in the EIA process to gather a precise and accurate EIA data that can be used as the data analysis for EIA recommendation. In order to describe the citizens' intention to participate in EIA with ICT, a behavioral measurement is performed to expose the field situation to get precise information regarding citizens' belief. The behavioral analysis also can be used by the EIA policy maker as a consideration to optimize the number of citizen participation by increasing the value of measured factors. The research has proposed a correlation of structural model among four factors. The analysis consists of four factors namely perceived government support (PGS), attitude (A), perceived behavior control (PBC), and behavior intention (BI). Four positive correlations have been proven, and the result reveals PBC as a key factor that can determine the citizens' intention to participate in the EIA process with ICT.

Table 1.Descriptive statistic, reliability and convergent validity result

Variable	Question	Mean	Stdev	FL	α	CR	AVE
PGS1	I feel I have a choice to use the strategies provided by the government for participating in the EIA process with ICT.	3.57	0.84	0.804	0.832	0.835	0.628
PGS2	I feel I have a choice to participate in an environmental program established by the government, such as the EIA process with ICT.	3.50	0.91	0.817			
PGS3	The government endorses the regulation to allow citizens participate in the EIA process with ICT.	3.41	0.90	0.755			
PBC1	I have the knowledge and time to participate in the EIA process with ICT.	4.02	0.78	0.798	0.761	0.757	0.740
PBC2	I have resources, time, ability and opportunities to participate in the EIA process with ICT.	3.78	0.78	0.762			
A1	For me, participating in the EIA process with ICT is extremely wise.	4.15	0.83	0.834	0.892	0.895	0.609
A2	For me, participating in the EIA process with ICT is favorable.	4.18	0.79	0.813			
A3	For me, participating in the EIA process with ICT is enjoyable.	4.19	0.76	0.930			
BI1	I am willing to participate in the EIA process with ICT.	4.02	0.75	0.804	0.852	0.835	0.628
BI2	I plan to participate in the EIA process with ICT when project development is conducted.	3.88	0.82	0.817			
BI3	I will make an effort to participate in the EIA process with ICT.	3.95	0.77	0.755			

Table 2.Model fit result

Variable	Result	Threshold
Goodness of fit (GFI)	0.907	$n \geq 0.90$
Normed fit index (NFI)	0.904	$n \geq 0.90$
Comparative fit index (CFI)	0.955	$n \geq 0.90$
Root mean square error of approximation (RMSEA)	0.08	$n \leq 0.08$
Root mean square residual (RMR)	0.03	$n \leq 0.08$

Table 3.Hypothesis validation result

Factor		Direct effect		Indirect effect		Hypothesis
		Coefficient (β)	Significant (p)	Coefficient (β)	Significant (p)	
A	\leftarrow PGS	.517	0.002	-	-	H1: Accepted
PBC	\leftarrow PGS	.444	0.002	-	-	H3: Accepted
BI	\leftarrow PGS	-	-	.429	0.001	Indirect
BI	\leftarrow A	.372	0.001			H2: Accepted
BI	\leftarrow PBC	.534	0.003	-	-	H4: Accepted

The interesting finding of this study is that the relationship between PGS and A, as the highest path correlation ($\beta_{PGS \rightarrow A} = 0.517$), has contributed lowest influence between A and BI ($\beta_{A \rightarrow BI} = 0.372$). Logically, the strongest path correlation influences as a chain reaction of A to become the major predictor for BI, but it was not appeared in this situation. A possible reason is because ICT-based EIA involvement not primarily utilized by many project owners to communicate with citizens. The project owners tend to employ a paper based medium and use ICT-based as a supplementary. Although the project owners agree to use ICT-based medium, the citizens are still habitually asked to send the paper based version as a reserve data. The redundancy process to utilize paper based and ICT-based medium might contribute to the low value of the attitude toward citizens' behavior intention to participate EIA with ICT. Hence, the study suggests the government to oblige the project owners to use ICT-based EIA involvement process as the primary medium instead of paper based to elevate the coefficient value of A to BI. Presumably, the coefficient of attitude to behavior intention will increase and hence the value of its correlation will be

elevated. The primary contributor of BI is PBC, which has the highest direct path correlation value than A ($\beta_{PBC \rightarrow BI} = 0.534$). The condition reflects the important role of perceived behavior control to affect citizens' belief. It can be seen that the citizens' have the resources and opportunities great enough to be used in the EIA involvement with ICT. The good resource of ICT can be well understood, since most of Indonesian people are familiar with digital devices and social networks. Moreover, with many chances to participate in several stages of EIA, the citizens can take the opportunities to look up the benefits of their personal interest. Based on this finding, the study can comfortably suggest to engage a structured and systematic ICT-based information framework in the EIA process. The implementation can be performed by transforming the EIA process into the electronic EIA (*e*-EIA) process through internet as well as sms-based technology gradually and adjusted according to the condition on each region. Finally, the variance percentage of behavior intention is about 51% ($R^2 = 0.51$), which means the four measurement factors are able to represent 51% of approximately citizens' intentions in EIA involvement with ICT. It can be also said that the half of the total intention to utilize ICT in EIA involvement is well described in these four factors. This research has a limitation on the respondents' data, where the majority of our respondents came from the west Indonesia region. This limitation can be used as a main consideration to collect more respondents in the other side of Indonesian regions. An exploration with additional factors is also suggested to improve the representation model for citizens' intention to participate in the EIA process with ICT.

References

- [1] Government of Indonesia. *Indonesian government regulation number 27/2012: environmental permit*. Jakarta, 2012.
- [2] Ministry of Environment. Ministry of Environment of Indonesian government regulation number 17/2012: guidelines for community involvement in environmental impact assessment process and environmental permit. ed. Jakarta; 2012.
- [3] Tan, M., Teo, T. S. Factors influencing the adoption of Internet banking. *Journal of the AIS* 2000; vol. 1, p. 5.
- [4] Ramayah, T., Soto-Acosta, P., Colomo-Palacios, R., Gopi, M., Popa, S. Explaining the adoption of Internet stock trading in Malaysia: comparing models. *Asian Journal of Technology Innovation* 2014; vol. 22, pp. 131-151.
- [5] Nadlifatin, R., Razif, M., Lin, S.-C., Persada, S. F., and Belgiawan, P. F. An Assessment Model of Indonesian Citizens' Intention to Participate on Environmental Impact Assessment (EIA): A Behavioral Perspective. *Procedia Environmental Sciences* 2015; vol. 28, pp. 3-10.
- [6] Government of Indonesia. Legislation of the Government of Indonesia number 11/2008: Information and Electronic Transaction. ed. Jakarta; 2008.
- [7] Ajzen, I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 1991; vol. 50, pp. 179-211.
- [8] Lin, S.-C. Persada, S. F., Nadlifatin, R. A study of student behavior in accepting the Blackboard Learning System: A Technology Acceptance Model (TAM) approach. *Computer Supported Cooperative Work in Design (CSCWD)*, Proceedings of the 2014 IEEE 18th International Conference 2014; pp. 457-462.
- [9] Lin, S. C. Nadlifatin, R., Persada, S. F.. An Investigation of Students' Experience towards Blackboard Learning System: a Behavioral Perspective Based on Extended Theory of Planned Behavior (TPB). *The International Conference on Service Sciences and Innovation (ICSSI-2014)*, Taiwan 2014.
- [10] Wahid, F. Using the technology adoption model to analyze internet adoption and use among men and women in Indonesia. *The Electronic Journal of Information Systems in Developing Countries* 2007; vol. 32.
- [11] Nugroho, Y. NGOs, the Internet and sustainable rural development: The case of Indonesia. *Information, Communication & Society* 2010; vol. 13, pp. 88-120.
- [12] Persada, S. F., Razif, M., Lin, S. C., Nadlifatin, R. Toward Paperless Public Announcement on Environmental Impact Assessment (EIA) through SMS Gateway in Indonesia. *Procedia Environmental Sciences* 2014; vol. 20, pp. 271-279.
- [13] Hooper, D. Coughlan, J., Mullen, M. Structural equation modelling: guidelines for determining model fit," *Articles*, p. 2; 2008.