

# Factors Influencing Engineers' Attitude towards Environmental Sustainability

*Siti Nur Fazillah Mohd Fauzi<sup>1\*</sup>, Nor'Aini Yusof<sup>1</sup>, Hanizam Awang<sup>1</sup> and Mohd Nurfadzli Mat Nah<sup>1</sup>*

<sup>1</sup>School of Housing, Building and Planning, Universiti Sains Malaysia, 11800 USM, Penang Malaysia.

**Abstract.** Engineers have a vital role in addressing environmental degradation in construction projects. Therefore, engineers' positive attitude towards the environment is important to ensure that construction projects are carried out responsibly. The objective of this paper is to investigate the factors that influence engineers' attitude towards green practice. Six factors; Knowledge, Self-initiative, Firm Support, Government Support, Board of Engineers Support and Client Attributes were assumed to influence the engineers' attitude towards green practice. A self-administered survey with 37 items was distributed to engineering firms in Peninsular Malaysia and 128 usable responses were received. The results show a moderate relationship with 32 percent of the variances in the relationship between the six factors and engineers' attitude. The results reveal that self-initiative and government support have a significant and positive impact on the engineers' attitude towards green practice with the higher effect coming from the support from the government ( $f^2 = 0.210$ ) as compared to self-initiative ( $f^2 = 0.058$ ). In contrast, the results provide insufficient evidence about the relationship between Knowledge, Firm Support, Board of engineers Support and Client Attributes and engineers' attitude towards green practice. The results serve as a guide to the policy makers and engineers to ensure responsible attitude can be adopted towards the environment.

## 1 Introduction

Engineers have a vital role in addressing environmental degradation in construction projects. Until the mid-20th century, the engineers' focus is on maximizing profit with less attention paid to the environment [1]. Presently, the current situation demands for the engineers to be more responsive and to find the solution that meets the need that persists in the current situation [2]. The challenge for engineers in the serving society has never been greater [3]. Cortese [4] noted that, the world demands for engineers to not only develop the land but at the same time sustain the environment and enhance human's health and well-being. In the case of sustainability, it is not similar like technical aspects in engineers' work (such as mechanics or hydraulics). Hence, the engineers must add another value in

---

\* Corresponding author: [sitinurfazillah84@gmail.com](mailto:sitinurfazillah84@gmail.com)

themselves in order to comply with sustainability, specifically in the environment aspect. Positive attitudes towards the environmental sustainability (ES) is one of the values that engineers should have in ensuring that construction projects can be carried out responsibly.

A number of studies were done to evaluate a person's attitude towards the environment and the factors that influence the attitude. Despite that, studies assessing the effect of the person themselves, the firm where engineers work and the external factors namely government, client and engineers' association simultaneously are scant. Therefore, the objective of this paper is to investigate the aforementioned factors that influence engineers' attitude towards ES. The results are important to guide the policy makers and engineers to be responsible for the environment.

## **2 Attitude**

Attitude is defined as a person's belief and feeling towards the environment [5]. Begum et al., [6] explain attitude in terms of a positive or negative feeling toward specific objects. Meanwhile, [7] describe 'attitude' as the acceptance towards things of interest whether it is a person, an object or an event. In short, attitude exhibits someone's preference, and their decision to act in an environmentally-sustainability way is based on their attitude [8].

Harun et al., [5] conceptualize attitude as the motivation and actual commitment in the environmental issue. In this study, engineers' attitude refers to responsible attitude towards the environment such as acknowledging that environmental sustainability is important and maintaining that everyone should protect and preserve the environment. Begum et al., [6] exhibit that the environment can be better if a person changes his or her attitude.

In the real world, many people have ignored the environmental threat as it does not directly affect the people [1]. As an example, the increase in one degree of warming may not be noticed by most people. This kind of attitude also recurs amongst professional engineers [1]. 'People matter, but their attitude to the natural world and to each other matter most of all [3]. The delivery of sustainable 'systems, technologies and attitudes' is a professional duty of engineers [9]. In situations where civil engineers are called upon to be leaders of the society [10], they should be able, surely, to strongly represent and practically implement its sustainability-ordered attitudes [11].

## **3 Factors influencing engineers' attitude**

Previous studies have identified several factors influencing attitudes. It is whether internal; from the engineers themselves such as knowledge and their self-initiative in finding the knowledge or external; which is outside factors namely firm, government and engineering body support and the client attributes towards ES. The following sections shall discuss these factors in greater detail

### **3.1 Knowledge**

Engineers need to prepare themselves with the ES knowledge as environmental destruction is one of the formidable challenges that engineers have to face in this era. In their study about Vision 2025 for engineers, Shen & Jensen [12] suggest that civil engineers will function as master builders. Sustainability is one of the dimensions in the body of knowledge (BOK) stressed by Shen & Jensen [12] in vision 2025.

The engineers as one of the professionals who are involved in Malaysian development especially in building and maintaining infrastructure projects should strengthen their

knowledge and understanding on ES-related issues. In the case of the engineers, their knowledge is needed early on at the design stage. Among the ES knowledge that engineers should have in relation to their scope of work is the application of the building rating system, ES design principles and ES building materials [13].

According to D'Souza et al., [14], the person who knows more about environmental problems would be the one proven to be more motivated to implement the ES. The knowledge will motivate engineers to become more proactive in solving environmental sustainability problem [1]. Harun et al., [5] state that the high level of environmental knowledge is antecedent to the positive attitudes. This relationship is also supported by Stoimenova [15] study. However, Stoimenova [15] ascertains that even if a person has knowledge, if they feel that it is not their responsibility to protect the environment, he or she might decline the knowledge that they have. Hence, the first hypothesis developed in this study is

H1: knowledge has positive influence on engineers' attitude towards ES

### **3.2 Self-initiative**

Self-initiative is the influential factor of attitudes which arises from the engineers themselves [16]. Self-initiative is how the engineers give their commitment to ES. It is not because of the obligation of the company but because they think that it is their responsibility to do so [17]. One of the engineers' self-initiatives can be seen from their commitment in spending time to receive the information on ES, searching for the information on ES verbally such as social learning; this is translated into them asking questions [18]; to the experts such as environmental engineer and environmental consultant; or to their colleagues or even clients.

The self-initiative can also be seen from the engineers' commitment in finding the information non-verbally through books, reports or magazines. For example, one of the informative magazines is *The Ingenieur* magazine published by the board of engineers Malaysia which regularly discussed the ES issue in engineers' perception particularly in the Malaysian case [19]. Therefore, the second hypothesis is:

H2: self-initiative has a positive influence on engineers' attitude towards ES

### **3.3 Firm support**

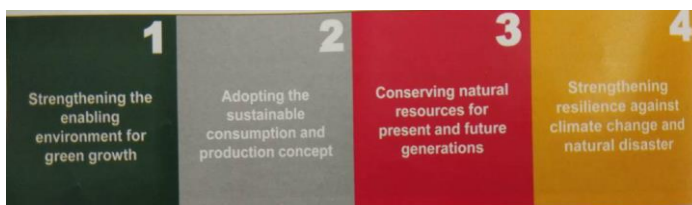
When a person is young, the ES practice tends to be influenced by the education and their friends and during adulthood, they tend to be influenced by the practice of the company where they work [20]. In this case, the firm plays an important role in shaping the engineer. The firm support in term of encouraging new environmental idea and engineers' participation in learning new environmental skills are important to develop engineers' good attitude towards ES [21]. Other than that, the support in term of commit time and fund for the engineers to attend environmental training is also the determinants of engineers' positive attitude towards the environment [22,23].

Training are the important part of firm support to make them engage in ES and build their competency in ES [22]. In Canada, O'Grady [13] identify two stage of training to the construction trades. The first one is to integrate the 'green construction' principles into the training standard, and next stage is the upgrade training for those who already complete the trades training. Muros [24], also agreed that a training is one of the ways to develop positive attitudes towards ES, other than the fact that organization strategizes their business and sets goal in sustainability. Therefore, the hypothesis developed is

H3: Firm support has a positive influence on engineers' attitude towards ES

### 3.4 Government support

Governments at both national and international levels are keen to promote the environmental protection agenda [25]. Malaysian government is of no exception. It can be seen from various initiatives in terms of financial incentives and regulatory that they protect the environment as Malaysia progressed [26]. Early in 1974, the Environment Quality Act was first implemented in Malaysia [27]. A lot of policies and initiatives was expended by the Malaysian government from that date, until recently, in the 11<sup>th</sup> Malaysia plan (2016-2020), the Malaysian government is given the priority to the ES through the strategic thrust of “pursuing green growth for sustainability and resilience”. Malaysia Plan is a thorough outline of government development policies and strategies, also referred as Malaysia’s 5-year plan as it will be restructured every 5 years [28]. The summary of the focus areas of ES in 11<sup>th</sup> Malaysia plan can be seen in figure 1.



**Fig. 1.** Summary of the focus areas of the 11<sup>th</sup> Malaysia plan 2016-2020 (Source: [19]).

Other than the policy, the financial incentives also show Malaysia’s support towards ES. In the past review, Olubunmi et al., [29] attained incentives as an important instrument in encouraging green building projects. The Green Technology Financial Scheme (GTFS), green Investment tax allowance (GITA) for project and green income tax exemption (GITE) were introduced by the Malaysian government in facilitating the nation’s journey to reduce 45% carbon emission by 2030 [30,31]. Previous studies have shown mixed result with regard to the influence of government support on engineers’ attitude towards ES. In general, the incentives and policy introduced by the Malaysian government is proven to be influencing the implementation of ES practice at business level [26, 32]. However Shafii, [33] argues that the incentives are not enough in encouraging the ES practice as the progress of green building development in Malaysia is still slow. Moreover, the incentives are given only to the developers and not the design team and practitioners constructing the building. Design team should not be disregarded as Elforгани & Rahmat [34] affirm that the design team such as civil engineers also has the influence on how building is constructed. Therefore, the government support should also be focused on the civil engineers. Hence, the hypothesis developed is:

H4: Government support influences engineers’ attitude towards ES

### 3.5 Engineers’ association support

On the subject of the engineering firm, whether it is large or small, they are usually united in one association [35]. Through this association, the commitment towards ES can be reaffirmed. In Malaysia, the engineering associations such as the Board of Engineers Malaysia (BEM) and Associate Consultant of Engineers Malaysia (ACEM) have a positive movement towards ES. It is proven by the involvement of ACEM together with PAM (Malaysian Institute of Architect) in developing Green Building Index (GBI) as one of the important rating tools in Malaysia

ACEM and BEM also actively promote the ES through a number of training, workshop and personal development that are related to ES. These associations are believed to have influenced the engineers’ attitude towards ES with their commitment and support. Hence, the hypothesis developed is

H5: Engineers’ association influences engineers’ attitude towards ES

### 3.6 Client attributes

Clients are important stakeholders who influence the engineers and consulting firms. Their decision at the early stage of the design is crucial in building green projects [33]. As evidence, Elforgani & Rahmat [34] found that client attributes such as knowledge and skill that clients possess, have a positive influence on the effective design team. It is concurrent with the study by Hes [36], which discovered that a large percentage (94%) of designers confirm that if ES becomes part of the client mission, they will confront the ES design solution. Then, the hypothesis developed is:

H6: Client attributes influence engineers’ attitude towards ES

## 4 Research method

A survey has been conducted to gather the “attitude-factors influencing” data. A questionnaire was used as the data collection instrument and seven variables; attitude and the six factors; Knowledge, Self-initiative, Firm Support, Government Support, Board of Engineers Support and Client Attributes assumed to influence the engineers’ attitude towards green practice was included in the questionnaire. Table 1 lists the constructs and number of items used in this study

**Table 1.** Construct and item used in this study

<b>Construct</b>	<b>Number of items</b>
Attitude	7
Knowledge,	5
Self-initiative,	4
Firm Support,	8
Government Support,	4
Engineers’ Association Support	4
Client Attributes	4
<b>Total</b>	<b>37</b>

There are two types of data collection adopted in this study namely 1) office delivery of questionnaire [37] and 2) self-selection sampling [38]. In the first method, the researcher delivers the questionnaire to the sample of respondents and this give the opportunity for the researcher to explain to them about the study. Then the questionnaire was left with the engineers for them to complete and the completed- questionnaire was picked up later. Because the engineers have a busy schedule, they are not always in the office and might also be in site, then they are also needed for the second stage of the data collection technique. This second technique has the advantage of the ability to reach “difficult to contact respondents” such as engineers [39]. In this self-selection sampling, the researcher advertised about the survey through appropriate media and asked the engineers to take part [38].

Because of a large number of civil engineers in Malaysia, doing a census is not the option. Hence, an adequate sample size is needed to be collected so that it represents the whole population as stressed by methodologists such as Haron et al., [40], Saunders et al., [38] and Babbie [37]. However, while doing this study, the exact population of civil

engineers in Malaysia is unknown because the Board of Engineers Malaysia did not update the data when this study took place. Hence, the usual calculation of the sample size using the table [38] pp. 281 and the metrics [40] pp. 143 are rejected. The other method which is widely used and the accepted rule of thumb is 10 observations or more the number per indicator of variables which include independent, dependent, moderating, mediating and control variables all considered as an acceptable sample size [41, 42]. Hence, considering this method, referring to table 1, this study has 37 items contributing to the sufficient sample size of 370. We distributed 444 questionnaire expecting 20% of non-response. The complete questionnaire however is 128 lending to the response rate of 34.6%

The data obtained from the survey was analysed using the PLS software. This software is appropriate to test the model with small sample size [40]. Compared to the first generation, this second generation software takes into account the error and loading of each item in the analysis making it more reliable. Furthermore, the software may simultaneously test the relationships among measured variables and latent variables as well as between latent variables [43]. There are two stages of analysis using the software. The first stage of analysis is to measure the quality of items used in the questionnaire via measurement model and the second stage is assessing the relationship of the attitude and the factors influencing via structural model [44].

## 4 Result and analysis

### 4.1 Respondent profile

The result for respondents' profile is shown in table 2. It can be seen that most of the respondents are male with 59.4% and the rest are female. Among them, only 0.8% is director, 8.7% engineers' manager, 26% senior engineers and most of them (64.4%) are engineers. A large number of engineers who participate in this survey are aged from 25 to 35 years old with 66.4% of all respondents. Most of the engineers complete their degree (78.1%), 17.2 % have master degree and only 2.3% are PhD holders. It is an analogous to the Malaysian industry that does not require a master or PhD in the industry.

**Table 2.** Profile of respondent

Characteristic	Frequency	Percentage
<i>Position</i>		
Director	1	0.8
Engineers Manager	11	8.7
Senior Engineer	33	26
Engineer	82	64.4
<i>Gender</i>		
Male	76	59.4
Female	50	39.1
<i>Age (years)</i>		
> 25	12	9.4
25 – 35	85	66.4
36 – 45	16	12.5
< 45	15	11.7
<i>Education level</i>		
Degree	100	78.1
Masters	22	17.2
PhD	3	2.3

### 4.2 Assessing the reliability and validity of the proposed model

This study attempts to assess the factors that shape the engineers’ attitudes towards environmental sustainability. Prior to the determination of the factors that influence engineers’ attitude using the structural model, the measurement model analysis was conducted to test the reliability and validity of the items used in the questionnaire as a data collection instrument. The reliability and validity were evaluated using the internal consistency reliability, convergent validity, and discriminant validity. The indicator of the assessment of the reliability and validity is shown in table 3.

**Table 3.** Criteria for the assessment of measurement model

Measurement model assessment	criteria	Results
Internal consistency reliability	Composite reliability > 0.70	Range 0.81 to 0.93 – all constructs are accepted
Convergent validity	AVE > 0.50	Range 0.51 – 0.73 all constructs are accepted
Discriminant validity	Fornell-Larcker Criterion	Each construct AVE is higher than its square root (SQRT) with any other construct

Source: Chin 1988; Hair et al., 2014; Bagozzi & Yi, 1988; Fitrianingrum, 2015; Haron,2017

In this study, the composite reliability of all constructs was above 0.7 signifying the internal reliability. The Average Variance Extracted surpassed 0.5 in all constructs, and the P values for all items being <0.001, and the loadings were greater than 0.5, indicating the convergent validity. The detailed result can be seen in table 4. The cross-loadings and inter-correlation tests showed that each opposing construct was less than any indicator load, and the value of the inter-correlations between the construct and other model constructs were greater than the square root of the AVE of a single construct, confirming the discriminant validity of all of the constructs. Table 4 reveals the composite reliability, AVE and Fornell-Larcker Criterion result for this study.

**Table 4.** The result for composite reliability, AVE and Fornell-Larcker Criterion for the items used by this study

	Composite reliability	AVE	Square roots of average variances extracted (AVEs)						
			Att	Knw	SI	FS	GS	EAS	CA
Att	0.967	0.855	<b>0.925</b>						
Knw	0.952	0.713	0.191	<b>0.845</b>					
SI	0.999	0.995	0.076	-0.110	<b>0.998</b>				
FS	0.964	0.770	0.291	0.150	-0.122	<b>0.877</b>			
GS	0.917	0.788	0.415	0.158	0.094	0.580	<b>0.888</b>		
EAS	0.977	0.913	0.425	0.135	0.021	0.455	0.705	<b>0.956</b>	
CA	1.000	0.999	0.082	0.033	-0.018	0.186	0.200	0.115	<b>0.999</b>

Att= Attitude; Knw= Knowledge; SI=Self-initiative; FS= Firm support; GS= Government support; Engineers’ Association support; CA= Client attributes.

### 4.3 Assessing the factors that influence the engineers’ attitude towards environmental sustainability

Subsequently, the evaluation of the structural model was performed. The results from the structural model show a moderate relationship with 32 percent of the variances in the relationship between the six factors and engineers’ attitude. The cross-validated redundancy or Stone–Geisser for engineers’ attitude  $Q^2=0.337$  is larger than zero; signifying a satisfactory level of predictive relevance. In addition, six quality indices for the whole model were calculated. The whole model showed an average path coefficient (APC)=0.167, where  $P=0.013$ ; Average R-squared (ARS)=0.325, where  $P<0.001$ ; Average adjusted R-squared (AARS)=0.292,  $P<0.001$ ; Average block VIF (AVIF)=1.798, which is within  $AVIF \leq 5$ ; Average full collinearity VIF (AFVIF)=1.538, complying the rules of  $AFVIF \leq 5$ ; and Tenenhaus GoF (GoF)=0.529, well beyond  $GoF \geq 0.36$  and are considered as large. The results reveal that self-initiative and government support have a significant and positive impact on the engineers’ attitude towards green practice with the higher effect coming from the support from the government ( $f^2 = 0.210$ ) as compared to self-initiative ( $f^2 = 0.058$ ). In contrast, the results provide insufficient evidence about the relationship between Knowledge, Firm Support, Board of Engineers’ Support and Client Attributes and Engineers’ attitude towards green practice. The detailed result for path coefficient and effect size for each factor is illustrated in figure 2.

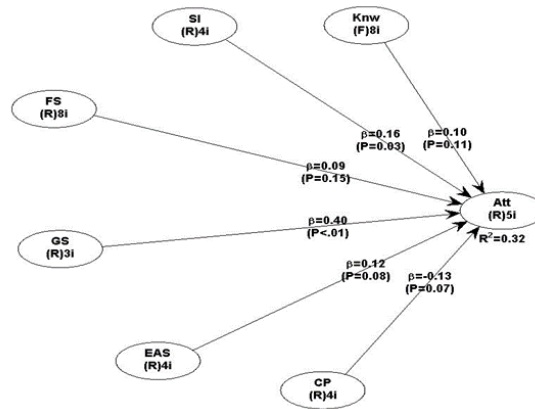


Fig. 2. Result of Assessment of structural model

The result in figure 2 was then analysed to make the decision whether the hypothesis is accepted or rejected. The result for hypothesis testing is show in table 5.

Table 5. The result for hypothesis testing in the structural model

Hypothesis	Relationship	Path coefficients	Decision
H1	Knowledge → Attitude	0.10	Not supported
H2	Self-initiative → Attitude	0.16**	Supported
H3	Firm support → Attitude	0.09	Not supported
H4	Government support → Attitude	0.40***	Supported
H5	Engineers’ association support → Attitude	0.12	Not supported
H6	Client attributes → attitude	0.13	Not supported

\*\* $p<.05$  \*\*\* $p<.01$



## 4 Discussion and conclusion

The present study aims to evaluate the factors that contribute to the engineers' attitude towards environmental sustainability. Six (6) hypotheses were tested and the result reveals that only two (2) hypotheses were supported namely; the relationship between self-initiative and attitude, and the relationship between government support and attitude. Both relationships are in positive direction implying that if the engineers themselves have self-initiative then they will have positive attitude towards environmental sustainability (supported H2), and if the Malaysian government gives support towards environmental sustainability, it will impact the engineers' attitude significantly (supported H4 with the  $p < .01$ ).

The result is very interesting as the factors that influence engineers' attitude come from the engineers themselves and the Malaysian government as a policy maker. The results are in line with Yusof et al., [26] and Abidin et al., [32] studies which found the impact of government support towards construction businesses. In this study, the result confirms that government support not only leaves an impact to firm and business but the individual practitioners as well. Meanwhile, for engineers' self-initiative, the result is in agreement with Cantor et al., [17] which measures the individual and firm factors towards environmental sustainability practice. The present study proves that the engineers' self-initiative in finding the information, and giving their time to learn about environmental sustainability, not only gives an effect to their practices but also to the attitude which is mostly known as the antecedent to the practices in the Theory of Planned Behaviour by Fishbein & Ajzen [45]. However, there is no evidence about the effect of other factors such as engineers' knowledge in environmental sustainability, firm and engineers' association support, and client attributes on engineers' attitude in environmental sustainability.

The results give an implication in both theoretical and practical perspectives. From the theoretical side, it extended the study of Cantor et al., [17] which considers only individual and organizational factors while in this study, the factors take into consideration three layers of assessment namely 1) individual (knowledge and self-initiative), 2) organizational (firm support) and 3) stakeholder influence (government, engineers' association body and client). From the practical side, the study alerts the government to give more support to the engineers as their support will impact the engineers' attitude extensively. In future research, the study suggests that the evaluation of engineers' attitude should be considered from the government, client and engineers' association points of view.

## References

1. I. Craig, D. Thorpe, S. Goh, Environmental sustainability education for engineers - some reflections and a suggested checklist of essential concepts. *Proceedings of the Society for Sustainability and Environmental Engineering International Conference (SSEE): Escaping Silos*, (pp. 1-16). Brisbane, Australia (2011)
2. H. J. Cruickshank, R. Fenner, The evolving role of engineers: towards sustainable development of the built environment. *J. Int. Dev.*, **19** (1), 111-121 (2007).
3. R. Duffell, Toward the environment and sustainability ethic in engineering education and practice. *J. Prof. Iss. Eng. Ed. Pr.*, 78-90 (1998).
4. A. D. Cortese, The critical role of higher education in creating a sustainable future. *Planning for higher education*, **31**(3), 15-22 (2003).
5. R. Harun, L. K. Hock, F. Othman, Environmental knowledge and attitude among students in Sabah. *World Applied Sciences Journal*, **14**, 83-87 (2011).

6. R. A. Begum, C. Siwar, J. J. Pereira, A. H. Jaafar, Attitude and behavioral factors in waste management in the construction industry of Malaysia. *Resour. Conserv. Recy.*, **53**, 321-328 (2009).
7. T. A. Lashari, M. Alias, Z. A. Akasah, M. J. Kesot, An effective-cognitive teaching and learning framework in engineering education. *ASEAN Journal of Engineering Education*, **1** (1), 11-24 (2012).
8. B. C. Tan, T. C. Lau, Attitude towards the environment and green products: consumer' perspective. *Manage. Sci. Eng.*, **4** (2), 27-39 (2010).
9. P. T. Robbins, B. Crow, Engineering and development: interrogating concepts and practices. *J. Int. Dev.*, **19**, 75-82 (2007).
10. B. A. Bowman, J. V. Farr, Embedding leadership in civil engineering education. *J. Prof. Iss. Eng. Ed. Pr.*, **126** (1), 16-20 (2000)
11. Z. Cywinski, Current philosophy of sustainability in civil engineering. *J. Prof. Iss. Eng. Ed. Pr.*, **127**, 12-16 (2001).
12. Z. Shen, W. Jensen, Civil engineers as master builders and the professionalization of construction. *Leadership and Management in Engineering*, **11** (2), 169-181 (2011).
13. J. O'Grady, The impact of climate change on employment and skills requirements in the construction industry. Canada. (2010)
14. C. D'Souza, M. Taghian, R. Khosla, Examination of environmental beliefs and its impact on the influence of price, quality and demographic characteristics with respect to green purchase intention. *Journal of Targeting, Measurement and Analysis for Marketing*, **15**, 69-78 (2007)
15. B. Stoimenova, Knowledge and attitudes about green consumption in Bulgaria. *Econ Themes*, **54** (4), 499-515 (2016)
16. K. Asfani, H. Suswanto, A. P. Wibawa, Influential factors of students' competence. *World Transactions on Engineering and Technology Education*, **14** (3), 416-420 (2016)
17. D. E. Cantor, P. C. Morrow, J. C. McElroy, F. Montabon, The role of individual and organizational factors in promoting firm environmental practices. *Int. J. Phys. Distr. Log.*, **43** (5/6), 407-427 (2013).
18. T. S. Hojem, K. H. Sorensen, V. A. Lagesen, Designing a 'green' building: expanding ambitions through social learning. *Building Research & Information*, **42** (5), 591-601 (2014).
19. T. Ingenieur, Transforming the construction industry. *Megazine of the Board of Engineers Malaysia* (2017).
20. L. Chawla, Life paths into effective environmental action. *The Journal of Environmental Education*, **31** (1), 15-26 (1999).
21. C. A. Ramus, Organizational support for employees: encouraging creative ideas for environmental sustainability. *Calif. Manage. Rev.*, **24** (3), 85-105 (2001).
22. T. Galphin, J. L. Whittington, G. Bell, Is your sustainability strategy sustainable? creating a culture of sustainability. *Corporate Governance*, **15** (1), 1-17 (2015).
23. N. Govindarajulu, B. F. Daily, Motivating employees for environmental improvement. *Ind. Manage. Data Syst.*, **104** (4), 364-372 (2004)
24. J. P. Muros, Going after the green: expanding industrial-organizational practice to include environmental sustainability. *Ind. Organ. Psych.*, **5**, 467-502 (2012)
25. P. O. Akadiri, O. O. Fadiya, Empirical analysis of the determinants of environmentally sustainable practices in the UK construction industry. *Construction Innovation*, **13** (4), 352-373 (2013)
26. N. Yusof, H. Awang, M. Iranmanesh, Determinants and outcomes of environmental practices in Malaysian construction projects. *J. Clean. Prod.*, **156**, 345-354 (2017)
27. P. A. Memon, Devolution of environmental regulation: environmental impact assessment in Malaysia. *Impact Assess Proj. A.*, **18** (4), 283-293 (2000)

28. IGI-Global. What is Malaysia Plan. Retrieved from IGI Global Disseminator of Knowledge: <http://www.igi-global.com/dictionary/malaysia-plan/17730>. (2018)
29. O. A. Olubunmi, P. B. Xia, M. Skitmore, Green building incentives: a review. *Renew. Sust. Energy Rev.*, **59**, 1611-1621 (2016)
30. M. G. MIDA, Green Technology Tax Incentives. Retrieved from MyHijau: <https://www.myhijau.my/green-incentives/> (2017)
31. K. Kamar, Z. Hamid, Sustainable construction and green building: the case of Malaysia. *WIT. Trans. Ecol. Envir.*, **167**, 15-22 (2011)
32. N. Abidin, N. Yusof, A. Othman, Enablers and challenges of a sustainable housing industry in Malaysia. *Construction Innovation*, **13** (1), 10-25 (2013)
33. F. Shafii, Green for better buildings . Retrieved from <http://web.utm.my/skypost> (2008)
34. M. S. Elforgani, I. Rahmat, An investigation of factors influencing design team attributes in green buildings. *American Journal of Applied Sciences*, **7** (7), 976-986 (2010)
35. F. FIDIC, N. UNEP, Industry as a partner for sustainable development: Consulting Engineering. United Kingdom: The Beacon Press (2002)
36. D. Hes, Facilitating "Green" building: turning observation into practice. Doctor of Philosophy, School of Architecture and Design, RMIT University, 253. Retrieved from Doctor of Philosophy, School of Architecture and Design, RMIT University (2005)
37. E. Babbie, *The practice of social research: eleventh edition*. Belmont, CA, USA: Thomson Wadsworth (2007).
38. M. Saunders, P. Lewis, A. Thornhill, *Research methods for business students, Fourth Edition*. Italy: Pearson Education Limited (2016)
39. K. B. Wright, Researching internet-based populations: advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computed-mediated communication*, **10** (3) (2005)
40. H. Haron, S. N. Khalid, Y. Ganesan, Y. Fernando, *A handbook for business research method*. Kuala Lumpur, Malaysia: Pearson Malaysia Sdn Bhd (2017).
41. U. Sekaran, R. Bougie, *Research Methods for Business: A Skill Building Approach. Fifth edition*. Haddington John Wiley & Sons (2010)
42. J. Nunnally, *Psychometric methods*, New York: McGraw Hill (1967).
43. J. F. Hair Jr, G. T. M. Hult, C. Ringle, M. Sarstedt, *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications (2014).
44. K. Tongsamsi, I. Tongsamsi, Instrument development for assessing knowledge management of quality assurers in Rajabhat universities, Thailand. *Kasetsart Journal of Social Sciences*, **38**(2), 111-116 (2017).
45. M. Fishbein, I. Ajzen, *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley (1975)