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[Elizabeth H. Zandstra, Álvaro H.P. Carvalho, Erica van Herpen. "Effects of front-of-pack social norm messages on food choice and liking", Food Quality and Preference, 2017](#)

[Persuasive Technology with Normative Feedback to Reduce Energy Consumption](#) Wayan [G. Santika](#) Dept. of Mechanical Engineering Bali State Polytechnic Bali, Indonesia wayan.santika@pnb.ac.id I Ketut Gede Sudiarta Dept. of Electrical Engineering Bali State Polytechnic Bali, Indonesia itutde@gmail.com Abstract— [The present study applies persuasive technology to promote energy conservation behaviour. The aim of the study is to investigate the role of descriptive norm in persuading air conditioner \(AC\) users](#) to select higher room temperatures to save energy. We predicted that, when their natural propensity to mimic other behaviour was exploited, people would behave accordingly. An experiment was conducted and 102 students participated. They were randomly assigned into control, animation and normative groups. Participants in the normative group were given descriptive norm feedback displayed on a computer screen, whereas those in animation group were given negative social feedback, which was, in our previous study, found to be effective in persuading AC users to set higher temperatures. Results show that [there was a significant effect of negative social and normative feedbacks on AC temperature setting](#). Participants in normative feedback group, having their natural predisposition to follow other behaviour triggered, set higher AC temperatures than those without any feedback. Participants in the animation (negative social) feedback group showed similar outcome, confirming previous study results. Implication of the finding is discussed in the discussion section. Keywords—persuasive technology; descriptive norm; negative social feedback; energy conservation; air conditioning; social influence. I. INTRODUCTION Technology has played a major role in helping modern humans survive and flourish. Apart from making human life easier, technology has a role of a promoter of sustainable behaviour [1]. Technology as a promoter of sustainable behaviour means that technology is utilized to encourage and to promote behaviours that use less energy and resources, thus minimizing their impacts to the environment. In this case, technology acts as a persuasive agent that influence the way people behave. The role of technology as a persuasive agent is called persuasive technology, which indicates all interactive technology systems developed to change human attitudes and behaviour [2]. Persuasive technology has been applied to various applications, from promoting fitness activities and healthy behaviour [3,4], to energy conservation [5,6,7], to medication for elders [8]. For example, Santika, et al [9] compared the effects of positive and negative social feedbacks from animation representing social agents on air conditioning (AC). The present study was funded by The Ministry of Research, Technology, and Higher Education of Indonesia under the scheme of Hibah Bersaing. 978-1-5090-3484-0/16/\$31.00 ©2016 IEEE temperature setting and found that negative social feedback had the strongest effect in influencing participants to set AC temperatures that consumed less energy. Since we have found the effect of social agents represented by animated persuasive technology on people preference for AC temperature setting, we also want to investigate the effect of social norm on the AC temperature preferences. Specifically, we consider the role of descriptive norms applied in persuasive technology in promoting sustainable behaviour. A study suggests that persuasion experts often fail to acknowledge the role of descriptive norms as a strong social influencer especially in relation to promoting pro- environmental behaviour [10]. Descriptive norm refers to the way most people behave in a certain situation [11] or the perception of what others do [12,13]. In other words, one's action is influence by the behaviour of most others. Humans have a predisposition to mimic the behaviour of others and it is driven, in part, by humans need for accuracy and social approval [14]. In a situation characterized by uncertainty, people tend to seek accuracy from the majority, sometimes to get approval from others. The purpose of [the present study is to find out the role of descriptive norm in persuading AC users](#) to set its temperatures at the points that consume less energy. Specifically, we examine the effect of descriptive norm feedback on AC temperatures set by users and compare it with the effect of negative social feedback on the temperatures. From thermodynamics we know that the higher the setting of the temperature the lower the energy requirement for cooling. A computer is programmed to be able to display descriptive norm feedback showing what temperature most people have chosen. This feedback is intended to provoke people propensity to imitate the behaviour of others. Having the perception that most others set a certain temperature (26oC in this case), we predict that respondents will react accordingly by setting temperatures at or close to 26oC. The effect of descriptive norm feedback on AC temperature setting is compared to that of negative social feedback. Previously, negative social feedback was found to be the most influential in persuading people to set higher AC temperatures [9]. II. METHODS A. Materials The materials for the present study was similar to those of the study of Santika, et al [9]. A remote controller interface was made and connected to a computer for the latter to read the temperatures set by users. The remote controller would send signals to AC and the interface at the same time allowing the computer to process the signals, save them, and respond with the appropriate feedback. Fig. 1. Descriptive norm display . Fig. 2. Negative social feedback display (or

animation) A program was made to display descriptive norm feedback (see Fig. 1). The display has two bars: the one on the right showed the actual AC temperature being set by the user, while the other was the decoy bar intended to make the participants think as if it represented the average temperature set by previous users. The bars are accompanied by displays of temperatures for both the current user and the previous users, symbols of a person and a group of people on the bottom of the bars, and their descriptions, which are "Pilihan anda" (it means the temperature you are choosing, in Indonesian) and "Pilihan terbanyak" (it literally means the temperature chosen the most, but in this case it also means the average temperature). The average temperature was prescribed. We chose 26°C as the average temperature expecting that participants would perceive it as the temperature most others had chosen and therefore influence them to set temperatures at 26°C or close to it. Another program to display negative social feedback was also made and is similar to that of study [9]. Fig. 2 shows an example of negative social feedback display at 26°C. The lower the temperature, the sadder the face expression. The animated social agent represents a real human being, which, according to Fogg [2], is capable of persuading people. In addition to its ability to display sad feeling through facial expression, the agent could also express utterance, such as bad, very bad, and extremely bad. Fig. 3. The experimental setting at which a participant was turning the AC on and given a negative social feedback from the computer screen B. Procedure The experiment was done from June to July 2016. 102 first and second year college students, 18 of them were female, from a medium size college in Bali were [participated in the study](#). They [were randomly](#) assigned [into](#) either [control](#), animation, or descriptive norm groups of equal sizes. Participants in the control group, one at a time, were asked to enter the room in which an experimenter had waited. The experimenter then asked each participant to imagine that they were in their own room installed with an indoor AC system and wanted to turn the AC on. Subsequently, each participant turned on the AC and set her/his preferred temperature. Prior to do so, the temperature setting on the remote controller was preset to 22°C (the middle value) to avoid bias. Once it was done, the respondent left the room and the experimenter recorded the temperature. Participants of the negative social feedback (animation) entered the room and the same experimenter waited inside. They were also asked to imagine that they were in their own room installed with an indoor AC system and wanted to turn the AC on. However, prior to turning the AC on and setting the temperature, they were introduced to an animated face on the computer screen called Rai. Rai was characterized to be a smart boy who loves to see people conserve energy. Rai would show a sad face if participants chose a low temperature. The lower the temperature the sadder the face. Rai also uttered negative comments, from a neutral comment at 25 °C to 'bad', 'very bad', and 'awful', at 18 °C. Later, respondents turned the AC on, chose temperatures that they wanted, and left the room. Fig. 3 shows an example of the experimental setting at which a participant was turning the AC on and given a negative social feedback from a computer screen. Descriptive norm participants, after entering the room, were also asked to imagine being in their own room with an AC and to turn it on. Before doing so, participants were shown the computer screen displaying what is shown in Fig. 1. They were told that the bar on the left side showed the average temperature set by participants before them, and it was 26°C. They were also made aware that the bar on the right side displayed their temperature choices. Subsequently, they turned on the AC, set the temperature, and left the room. Once the experiment finished, data were collected and participants were debriefed. Data were processed using Microsoft Excel and SPSS.

III. RESULTS AND DISCUSSION Table 1 shows that the average AC temperatures set by control, animation, and norm groups are 21.18, 24.09, and 24.74 °C, respectively. [There was a significant effect of](#) negative [social](#) and normative feedbacks [on](#) AC temperature setting,  $F(2,99) = 25.72, p < 0.01$ . Fig. 4 depicts the average AC temperature setting from those groups. A planned contrast has been done using SPSS to compare means of each group. Results show [that there was a significant difference in](#) AC temperatures [set by the](#) normative feedback [group](#) ( $M=24.74; SD=1.6$ ) [and the control group](#) ( $M=21.18, SD=2.76$ ),  $t(99)=6.73, p < 0.01$ . [There was also a significant difference in](#) AC temperatures [set by the](#) negative social feedback [group](#) ( $M=24.09; SD=2.02$ ) [and the control group](#) ( $M=21.18, SD=2.76$ ),  $t(99)=5.51, p < 0.01$ . On [the](#) other hand, we found no [significant difference in](#) AC temperature set by the normative feedback [group](#) ( $M=24.74; SD=1.6$ ) [and the](#) negative social feedback [group](#) ( $M=24.09; SD=2.02$ ),  $t(99)=1.22, p = 0.22$ . Table 1. Descriptive Statistics N Mean Std. Deviation Std. Error Min. Max Control 34 21.18 2.758 .473 18 28 Animation 34 24.09 2.021 .347 20 28 Norms 34 24.74 1.601 .275 20 27 Total 102 23.33 2.660 .263 18 28

Fig. 4. Average AC temperature setting of control, animation, and norm groups These results suggest that providing the normative (descriptive) feedback or the negative social feedback really have effects on AC temperature setting. Specifically, our results suggest that when people who set AC temperatures receive normative (descriptive norm) feedback or negative social feedback, they choose higher temperatures than those receiving no feedback. The negative social feedback result confirms the previous study finding [9] suggesting that computer and technology in general have a role of social agents that may influence people as if the computer was a real person. As a social agent, computer can give feedbacks, rewards, examples and lessons to follow, as well as social supports [2]. The finding is also in accordance with other studies using descriptive norm messages to influence others, such as in promoting healthier eating [15], cancer treatment decisions [16], everyday health behaviour [17], linen and towel use [18], and predicting driver's intentions to violate [19]. For example, in promoting fruit and vegetable intake, Robinson, et al. [15] [found that exposure to a descriptive norm message increased](#) preference for fruit [and](#) vegetables for lunch. Another study by Burger and Shelton [17] shows that descriptive norm manipulations persuade people to use stairs and at the same time reduce elevator use by 46%. Human has a natural predisposition to follow other behaviour and there are evolutionary benefits to do so. Mimicking what most others do, usually for accuracy and social approval [14], increases an individual chance of survival. The present study, nevertheless, has some limitations. First, the experiment was in a laboratory setting and not a natural field experiment. Second, the participants were college students only. Both reasons limit the generalization of the study. Lastly, the study uses computers to deliver the message and feedback. This method is more expensive and more complicated than those using simple messages on printed media [15-18]. Future studies aimed at promoting energy conservation may exploit human propensity to mimic others using simple printed messages to find out if this cheap technique produces comparable positive results. Other studies [13,15-18] have shown that the technique is effective. A recent study of Santika, et al. even exploited our natural tendency to obey others in authority using a simple message [20]. A message exploiting both descriptive norms and obedience to authority may create a more persuading effect. IV. CONCLUSION The present study examine the effect of descriptive norm and negative social feedbacks on AC room temperature preferences. Results show that both feedbacks have positive effects on AC room temperature setting. People who had descriptive norm or negative social feedbacks set AC room temperatures at higher degrees than those without any feedback. ACKNOWLEDGMENT The authors would like to thank Mastawan Eka Putra, I Wayan Sutarsa, and I Made Widiartara for their contribution during the experimentation. REFERENCES [1] C.J.H. Midden, F.G. Kaiser, and L.T. McCalley, "Technology's four roles in understanding individuals' conservation of natural resources," Journal of Social Issues. vol. 63, no. 1, pp. 155-174, 2007. [2] B.J. Fogg, "Persuasive Technology: Using Computers to Change What We Think and Do," San Fransisco, CA: Morgan Kaufmann Publishers, 2003. [3] T. Fritz, E.M. Huang, G.C. Murphy, and T. Zimmermann, "Persuasive technology in the real world: a study of long-term use of activity sensing [4] [5] [6] [7] [8] [9] devices for fitness," [In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems](#), pp. 487-496. ACM, 2014. S. Purpura, V. Schwanda, K. Williams, W. Stubler, and P. Sengers, "Fit4life: the design of a persuasive technology promoting healthy behavior and ideal weight," [In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems](#), pp. 423-432. ACM, 2011. M. Bang, C. Torstensson, and C. Katzeff, "The powerhouse: A persuasive computer game designed to raise awareness of domestic energy consumption," in International Conference on Persuasive Technology, pp. 123-132. Springer Berlin Heidelberg, 2006. L. Gamberini, A. Spagnolli, N. Corradi, G. Jacucci, G. Tusa, T. Mikkola, L. Zamboni, and E. Hoggan, "Tailoring feedback to users' actions in a persuasive game for household electricity conservation," in International Conference on Persuasive Technology, pp. 100-111, Springer Berlin Heidelberg, 2012. J. Ham, C.J.H. Midden, and F. Beute, "Can ambient persuasive technology persuade unconsciously?: using subliminal feedback to influence energy consumption ratings of household appliances" in Proceedings of the 4th International Conference on Persuasive Technology, pp. 29. ACM, 2009. R. De Oliveira, M. Cherubini, and N. Oliver, "MoviPill: improving medication compliance for elders using a mobile persuasive social game," in Proceedings of the 12th ACM international conference on Ubiquitous computing, pp. 251-260. ACM, 2010. W.G. Santika, I.K.G. Sudiarta, and I.G.P.M.E. Putra, "Using animated social feedback to motivate air conditioning energy saving," in 2015 International Conference on Science and Technology (TICST), pp. 15- 19. IEEE, 2015. [10] J.M. Nolan, P.W. Schultz, R.B. Cialdini, N.J.

Goldstein, and V. Griskevicius. "Normative social influence is underdetected," *Personality and Social Psychology Bulletin* 34, no. 7, 2008, pp. 913-923. [11] A. Rivas and P. Sheeran. "Descriptive norms as an additional predictor in the theory of planned behaviour: A meta-analysis." *Current Psychology* 22, no. 3, 2003, pp. 218-233. [12] P. Sheeran and S. Orbell, "[Augmenting the theory of planned behavior: Roles for anticipated regret and descriptive norms](#)," *Journal of Applied Social Psychology* 29, no. 10, 1999, pp. 2107-2142. [13] N.J. Goldstein, R.B. Cialdini, and V. Griskevicius, "A room with a viewpoint: Using social norms to motivate environmental conservation in hotels," *Journal of Consumer Research* 35, no. 3, 2008, pp. 472-482. [14] R.B. Cialdini and N.J. Goldstein. "Social influence: Compliance and conformity," *Annu. Rev. Psychol.* 55, 2004, pp. 591-621. [15] [E. Robinson, A. Fleming,](#) and S. [Higgs,](#) "[Prompting healthier eating: Testing the use of health and social norm based messages](#)," *Health Psychology* 33, no. 9, 2014, pp. 1057-1064. [16] B.J. Zikmund-Fisher, P.D. Windschitl, N. Exe, and P.A. Ubel, "'I'll do what they did': Social norm information and cancer treatment decisions," *Patient education and counseling* 85, no. 2, 2011, pp. 225- 229. [17] J.M. Burger and M. Shelton, "Changing everyday health behaviors through descriptive norm manipulations," *Social Influence* 6, no. 2, 2011, pp. 69-77. [18] W.G. Santika, D.M. Suria Antara, and A.A.A.N. Harmini, "Memotivasi perilaku hemat energi dan ramah lingkungan di sebuah hotel," *Bumi Lestari Journal of Environment* 13, no. 2, 2013, pp. 374-383. [19] S.E. Forward, "[The theory of planned behaviour: The role of descriptive norms and past behaviour in the prediction of drivers' intentions to violate](#)," *Transportation Research Part F: Traffic Psychology and Behaviour* 12, no. 3, 2009, pp. 198-207. [20] W.G. Santika, I.K.G. Sudiarta, and I.M. Widiarta, "[Social influence and energy conservation: Using obedience to authority to promote air conditioning energy saving](#)," in *Proceedings of the 1st International Joint Conference on Science and Technology*, October 2016. ??? ??? ??? ???