

The Influence of Regulatory Focus on Consumer Responses to Smart Home Services for Energy Management

Moon-Yong Kim¹, Heayon Cho²

¹*Professor, College of Business, Hankuk University of Foreign Studies, Seoul, Korea*

²*Instructor, Dep. of Interior Architecture & Built Environment, Yonsei University, Seoul, Korea*

E-mail: ¹moonyong@hufs.ac.kr, ²hycho2@hotmail.com

Abstract

Smart homes have become the state of the art in the reduction and monitoring of energy usage within a residential setting. Emerging threats such as climate change, global warming and volatility in energy prices have fuelled the interest in smart systems. Given that environmental sustainability has become a more significant factor for consumers, this research examines whether consumers' attitudes toward smart home services for efficient energy management differ according to their regulatory focus. Specifically, it is predicted that consumers will have more favorable attitudes toward smart home services for efficient energy management when they are promotion-focused (vs. prevention-focused). The results indicate that respondents with a promotion (vs. prevention) focus reported significantly more favorable attitudes toward smart home services for energy management (e.g., smart cooling/heating system, smart ventilation & air conditioning system, smart thermostats, smart plugs, and smart switches). We suggest that regulatory focus may be an effective marketing and segmentation tool in promoting smart home services for energy management and facilitating their receptiveness to the services.

Keywords: *Smart Home Services, Energy Management, Regulatory Focus, Promotion, Prevention*

1. Introduction

The Internet of Things (IoT) has created many powerful applications which allow users to interact directly with smart objects in smart environments to improve work efficiency and life quality [1]. In particular, smart home technology as an application of IoT incorporates intelligence and automation into home environment for comfort, control, security, safety, healthcare, and energy conservation [2]. In accordance with the traditional concept of the automated and/or ubiquitous home, a smart home has been defined as a residence equipped with a communications network, linking sensors and domestic devices and appliances that can be remotely monitored, accessed, or controlled and that provide services that respond to the needs of its inhabitants [3]. That is, a smart home provides various intelligent home services that promote productivity and enhance living experience by utilizing information technology (IT) [4]. Smart home

services are all-in-one remote-control services that can handle all equipment and devices installed in a home; these include home applications, facilities, utilities such as electricity and water supply, and air conditioning, boilers, refrigerators, and TVs [2]. Driven by the rapidly diffused infrastructure of mobile network environments, the demand for smart home services has increased exponentially [3].

Smart homes, in particular, have become the state of the art in the reduction and monitoring of energy usage within a residential setting [5]. Emerging threats such as climate change, global warming and volatility in energy prices have fuelled the interest in smart systems. One major benefit of smart home services is the potential to support energy monitoring and cost savings [6]. Similarly, according to Sovacool and del Rio [7], the most prominent benefit smart home technologies can offer households, businesses, or society was the ability to better manage energy services or reduce energy consumption. Given that environmental sustainability has become a more significant factor for consumers, therefore, this research aims to examine whether consumers' attitudes toward smart home services for efficient energy management differ according to their regulatory focus. More specifically, this research examines whether consumers will have more favorable attitudes toward smart home services for efficient energy management when they are promotion-focused (vs. prevention-focused).

2. Theoretical Background and Hypothesis Development

Environmentally responsible behaviors are generally considered to be behaviors that are focused on protecting the natural environment [8]. Some frequently investigated environmentally responsible behaviors include such actions as using public transportation, riding a bicycle, walking, turning heat down, turning off lights and appliances, using energy efficient light bulbs, recycling products or packaging, and so on [8-10].

On the other hand, Higgins' regulatory focus theory [11] has gained influence in psychology, marketing, and beyond because of its ability to explain a wide range of consumer phenomena and predict a variety of psychological processes and behaviors. Promotion and prevention foci are independently co-existing self-regulatory systems, and individuals tend to act in accordance with the focus that is currently active [12].

Recent research finds that individuals with a promotion focus seem to be more inclined to buy green products rather than individuals with a prevention focus [13]. This might be because prevention-focused individuals prefer to maintain the status quo and are less inclined to accept new and uncertain situations, whereas promotion-focused individuals welcome a change in their habits as long as they think it will benefit them [14]. More importantly, there is prior evidence that individuals who report high levels of concern for the future exhibit high levels of environmentally responsible behaviors [15]. In addition, Joireman and his colleagues [16] demonstrated that individuals who consider the long-term consequences of their behavior report high promotion-focus but not prevention-focus scores [17]. This relationship occurs because promotion-focused individuals, in keeping with a future orientation, adopt distal and abstract ideal self-goals (i.e., hopes and aspirations) whereas prevention-focused individuals, in keeping with a more present orientation, adopt more proximal and concrete self-goals (i.e., duties and obligations) [11]. In summary, being environmentally concerned necessitates a concern for the long-term, future consequences of behavior, and promotion-focused individuals have a high concern for long-term consequences. Given that individuals' chronic promotion focus is a more important environmental-concern predictor than chronic prevention focus [18], promotion- (vs. prevention-) focused individuals will have more favorable attitudes toward pro-environmental products/services. Combining the discussions above, thus, it is predicted that consumers will have more favorable attitudes toward smart home services for efficient energy management when they are promotion-focused (vs. prevention-focused).

3. Method

In this study, 180 undergraduate students (77 females, 103 males) at a mid-sized university who ranged in age from 18 to 28 years (mean = 21, SD = 2.06) completed the survey. The survey contained items measuring the respondents' regulatory focus and their overall attitudes toward each smart home service for energy management, along with their demographic characteristics (e.g., age, gender, academic major).

Specifically, the regulatory focus scale has been validated in previous research [17]. The scale had 18 items, half of which measured promotion focus and the other half of which measured prevention focus. Using a 7-point scale, respondents indicated the extent to which they endorsed items relevant to a promotion focus and items relevant to a prevention focus (see Tables 1 and 2). The responses were averaged ($\alpha = .877$ for promotion focus, and $\alpha = .772$ for prevention focus). Following previous research [17, 19, 20], a measure of dominant regulatory focus was created by subtracting the prevention focus score from the promotion focus score. That is, high scores reflected relative stronger promotion focus than prevention focus. All the respondents were classified as either promotion-focused ($n = 97$) or prevention-focused ($n = 83$) on the basis of a median split ($M_{dn} = 1.000$).

Table 1. Measurement items for promotion focus

Construct	Measurement items
Promotion focus	<p>I frequently imagine how I will achieve my hopes and aspirations.</p> <p>I often think about the person I would ideally like to be in the future.</p> <p>I typically focus on the success I hope to achieve in the future.</p> <p>My major goal in school right now is to achieve my academic ambitions.</p> <p>In general, I am focused on achieving positive outcomes in my life.</p> <p>I often imagine myself experiencing good things that I hope will happen to me.</p> <p>Overall, I am more oriented toward achieving success than preventing failure.</p> <p>I see myself as someone who is primarily striving to reach my "ideal self"-to fulfill my hopes, wishes, and aspirations.</p> <p>I often think about how I will achieve academic success.</p>

Table 2. Measurement items for prevention focus

Construct	Measurement items
Prevention focus	<p>I frequently think about how I can prevent failures in my life.</p> <p>I am anxious that I will fall short of my responsibilities and obligations.</p> <p>I often think about the person I am afraid I might become in the future.</p> <p>In general, I am focused on preventing negative events in my life.</p> <p>I often worry that I will fail to accomplish my academic goals.</p> <p>I often imagine myself experiencing bad things that I fear might happen to me.</p> <p>I am more oriented toward preventing losses than I am toward achieving gains.</p> <p>My major goal in school right now is to avoid becoming an academic failure.</p> <p>I see myself as someone who is primarily striving to become the self I "ought" to be-fulfill my duties, responsibilities, and obligations.</p>

With regard to the smart home services for energy management, we focused on five smart home services (i.e., smart cooling/heating system, smart ventilation & air conditioning system, smart thermostats, smart plugs, and smart switches). The overall attitude toward the smart home services for energy management was

measured using a single item. The scale for the overall attitude consists of one item assessing overall evaluation on a 7-point scale anchored by “I like it very much” and “I dislike it very much” [21]. Two of the most widely employed constructs in advertising and consumer research are attitude toward the ad and brand attitude. Both constructs are doubly concrete—that is, they have a simple, clear object (e.g., an ad or a brand) and a single and single-meaning attribute (e.g., liking) [22]—and, therefore, should be validly measurable by a single item, even though the overwhelming practice in academic research is to measure them with multiple items [21-23]. In previous research, for doubly concrete constructs, single-item measures demonstrated predictive validity equal to that of multiple-item measures [21-23]. Moreover, researchers may decide to opt for single-item measures in light of their manifold practical advantages [24, 25].

4. Results

ANOVA was performed to test the prediction. The results are summarized in Table 3. Specifically, for all of the smart home services for energy management, overall attitude score was significantly higher in the promotion- (vs. prevention-) focused respondents. In summary, consistent with the prediction, it was found that consumers have more favorable attitudes toward smart home services for efficient energy management when they are promotion-focused (vs. prevention-focused).

Although this research used individuals’ chronic differences in regulatory orientations, these regulatory orientations can also be activated by situational demands, such as through experimental promotion versus prevention framing [26]. That is, as the two self-regulatory foci can be situationally induced, the findings imply that it might be useful to make the promotion focus salient within the marketing stimuli as this research shows that high promotion relates to greater pro-environmental consumption.

Table 3. Hypothesis testing results

	Promotion focus (n = 97)		Prevention focus (n = 83)		F-value	p-value
	Mean	SD	Mean	SD		
Smart cooling/heating system	6.08	1.21	5.47	1.43	9.700	.002
Smart ventilation & air conditioning system	6.36	.98	5.71	1.36	13.817	.000
Smart thermostats	6.17	1.06	5.71	1.38	6.256	.013
Smart plugs	6.03	1.26	5.62	1.38	4.475	.036
Smart switches	6.02	1.28	5.60	1.28	4.804	.030

5. Conclusion

This research examines whether consumers’ attitudes toward smart home services for efficient energy management differ according to their regulatory focus. In support of the prediction, the results indicate that consumers with a promotion (vs. prevention) focus have more favorable attitudes toward smart home services for energy management. Both theoretical and practical implications can be drawn. In a theoretical perspective, we extend previous findings by showing the role of consumers’ regulatory focus in the context of smart home services for energy management. In a practical perspective, we suggest that regulatory focus may be an effective marketing and segmentation tool in promoting and facilitating smart home services for energy management. The application of regulatory focus may be particularly appealing to managers because of implementation ease.

Although this research provides theoretical and practical implications, it is not without limitations. First, instead of student samples, a more representative sample could enhance the generalizability of the findings.

Second, future work can extend this line of research by using priming procedures to activate individuals' regulatory goals. Third, it would be good for future research to investigate if the findings are applicable to other pro-environmental smart home services. Finally, future research should consider other potential factors that can influence consumers' attitudes toward smart home services for energy management.

Acknowledgement

This work was supported by Hankuk University of Foreign Studies Research Fund of 2020.

References

- [1] A. Shuhaiber and I. Mashal, "Understanding Users' Acceptance of Smart Homes," *Technology in Society*, Vol. 58, p. 101110, August 2019.
DOI: <https://doi.org/10.1016/j.techsoc.2019.01.003>.
- [2] M.R. Alam, M.B.I. Reaz, and M.A.M. Ali, "A Review of Smart Homes—Past, Present, and Future," *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, Vol. 42, No. 6, pp. 1190-1203, November 2012.
DOI: 10.1109/TSMCC.2012.2189204.
- [3] N. Balta-Ozkan, B. Boteler, and O. Amerighi, "European Smart Home Market Development: Public Views on Technical and Economic Aspects across the United Kingdom, Germany and Italy," *Energy Research & Social Science*, Vol. 3, No. 2, pp. 65-77, September 2014.
DOI: <https://doi.org/10.1016/j.erss.2014.07.007>.
- [4] B. Zhang, P.P. Rau, and G. Salvendy, "Design and Evaluation of Smart Home User Interface: Effects of Age, Tasks and Intelligence Level," *Behaviour & Information Technology*, Vol. 28, No. 3, pp. 239-249, April 2009.
DOI: <https://doi.org/10.1080/01449290701573978>.
- [5] D. Marikyan, S. Papagiannidis, and E. Alamanos, "A Systematic Review of the Smart Home Literature: A User Perspective," *Technological Forecasting & Social Change*, Vol. 138, pp. 139-154, January 2019.
DOI: <https://doi.org/10.1016/j.techfore.2018.08.015>.
- [6] R. Ford, M. Pritoni, A. Sanguinetti, and B. Karlin, "Categories and Functionality of Smart Home Technology for Energy Management," *Building and Environment*, Vol. 123, pp. 543-554, October 2017.
DOI: <https://doi.org/10.1016/j.buildenv.2017.07.020>.
- [7] B.K. Sovacool and D.D.F. del Rio, "Smart Home Technologies in Europe: A Critical Review of Concepts, Benefits, Risks, and Policies," *Renewable and Sustainable Energy Reviews*, Vol. 120, p. 109663, March 2020.
DOI: <https://doi.org/10.1016/j.rser.2019.109663>.
- [8] M. Cleveland, M. Kalamas, and M. Laroche, "Shades of Green: Linking Environmental Locus of Control and Pro-Environmental Behaviors," *Journal of Consumer Marketing*, Vol. 22, No. 4, pp. 198-201, June 2005.
DOI: <https://doi.org/10.1108/07363760510605317>.
- [9] A.T. Ngo, G.E. West, and P.H. Calkins, "Determinants of Environmentally Responsible Behaviors for Greenhouse Gas Reduction," *International Journal of Consumer Studies*, Vol. 33, No. 2, pp. 151-161, April 2009.
DOI: <https://doi.org/10.1111/j.1470-6431.2009.00763.x>.
- [10] S. Yoon, Y. Kim, and T. Baek, "Effort Investment in Persuasiveness: A Comparative Study of Environmental Advertising in the United States and Korea," *International Journal of Advertising: The Review of Marketing Communications*, Vol. 35, No. 1, pp. 93-105, January 2016.
DOI: <https://doi.org/10.1080/02650487.2015.1061963>.
- [11] E.T. Higgins, "Beyond Pleasure and Pain," *The American Psychologist*, Vol. 52, No. 12, pp. 1280-1300, December 1997.
DOI: <https://doi.org/10.1037/0003-066X.52.12.1280>.

- [12] E.T. Higgins, "How Self-Regulation Creates Distinct Values: The Case of Promotion and Prevention Decision Making," *Journal of Consumer Psychology*, Vol. 12, No. 3, pp. 177-191, May 2002.
DOI: https://doi.org/10.1207/S15327663JCP1203_01.
- [13] A.P. Codini, G. Miniero, and M. Bonera, "Why Not Promote Promotion for Green Consumption? The Controversial Role of Regulatory Focus," *European Business Review*, Vol. 30, No. 5, pp. 554-570, August 2018.
DOI: <https://doi.org/10.1108/EBR-09-2016-0118>.
- [14] H. Halvorson and E.T. Higgins, "Do You Play To Win-or Not To Lose?" *Harvard Business Review Online*, Vol. 91, No. 3, pp. 117-120, March 2013.
- [15] J.J. Lindsay and A. Strathman, "Predictors of Recycling Behavior: An Application of a Modified Health Belief Model," *Journal of Applied Social Psychology*, Vol. 27, pp. 1799-1823, October 1997.
DOI: <https://doi.org/10.1111/j.1559-1816.1997.tb01626.x>.
- [16] J.A. Joireman, M.J. Shaffer, D. Balliet, and A. Strathman, "Promotion Orientation Explains Why Future-Oriented People Exercise and Eat Healthy: Evidence from the Two-Factor Consideration of Future Consequences-14 Scale," *Personality and Social Psychology Bulletin*, Vol. 38, No. 10, pp. 1272-1287, October 2012.
DOI: <https://doi.org/10.1177/0146167212449362>.
- [17] P. Lockwood, C.H. Jordan, and Z. Kunda, "Motivation by Positive or Negative Role Models: Regulatory Focus Determines Who Will Best Inspire Us," *Journal of Personality and Social Psychology*, Vol. 83, No. 4, pp. 854-864, 2002.
DOI: 10.1037/0022-3514.83.4.854.
- [18] N. Bhatnagar and J. McKay-Nesbitt, "Pro-Environment Advertising Messages: The Role of Regulatory Focus," *International Journal of Advertising*, Vol. 35, No. 1, pp. 4-22, January 2016.
DOI: <https://doi.org/10.1080/02650487.2015.1101225>.
- [19] J. Cesario, H. Grant, and E.T. Higgins, "Regulatory Fit and Persuasion: Transfer from "Feeling Right,"" *Journal of Personality and Social Psychology*, Vol. 86, No. 3, pp. 388-404, 2004.
DOI: <https://doi.org/10.1037/0022-3514.86.3.388>.
- [20] J. Keller and H. Bless, "Regulatory Fit and Cognitive Performance: The Interactive Effect of Chronic and Situationally Induced Self-Regulatory Mechanisms on Test Performance," *European Journal of Social Psychology*, Vol. 36, No. 3, pp. 393-405, May 2006.
DOI: <https://doi.org/10.1002/ejsp.307>.
- [21] L. Bergkvist and J.R. Rossiter, "The Predictive Validity of Multiple-Item versus Single-Item Measures of the Same Constructs," *Journal of Marketing Research*, Vol. 44, No. 2, pp. 175-184, May 2007.
DOI: <https://doi.org/10.1509/jmkr.44.2.175>.
- [22] J.R. Rossiter, "Marketing Measurement Revolution: The C-OAR-SE Method and Why It Must Replace Psychometrics," *European Journal of Marketing*, Vol. 45, No. 11, pp. 1561-1588, 2011.
DOI: 10.1007/978-1-4419-7158-6.
- [23] L. Bergkvist, "The Nature of Doubly Concrete Constructs and How to Identify Them," *Journal of Business Research*, Vol. 69, No. 9, pp. 3427-3429, September 2016.
DOI: <https://doi.org/10.1016/j.jbusres.2016.02.001>.
- [24] U. Böckenholt and D.R. Lehmann, "On the Limits of Research Rigidity: The Number of Items in a Scale," *Marketing Letters*, Vol. 26, No. 3, pp. 257-260, May 2015.
DOI: 10.1007/s11002-014-9325-y.
- [25] A.L. Drolet and D.G. Morrison, "Do We Really Need Multiple-Item Measures in Service Research?" *Journal of Service Research*, Vol. 3, No. 3, pp. 196-204, February 2001.
DOI: <https://doi.org/10.1177/109467050133001>.
- [26] T. Avnet and E.T. Higgins, "How Regulatory Fit Affects Value in Consumer Choices and Options," *Journal of Marketing Research*, Vol. 43, No. 1, pp. 1-10, February 2006.
DOI: <https://doi.org/10.1509/jmkr.43.1.24>.