

An Empirical Study of Consumer Adoption of Internet of Things Services

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Abstract

Internet of things (IoT) is considered as a next-generation digital revolution to connect things with an embedded system to the Internet, which will lead to dramatic changes in our lives. The purpose of this paper is to identify the antecedents of consumers' attitudes toward IoT, and test their influences on the attitudes and behaviors of consumers. To reach the research goal, this paper develops and tests factors determining user acceptance of IoT services by using an extended unified theory of acceptance and use of technology (UTAUT) model, which includes a factor of the hindering condition. Based on the structural equation modeling (SEM) analysis of 224 survey responses, the result shows that performance expectancy, social influence, facilitating condition, and hindering condition have a strong effect on behavioral intention to use IoT services, but effort expectancy does not support the relationship with behavioral intention.

Keywords: IoT, technology adoption, user behavior, UTAUT-H

References

- [1] S. Shin and B. Eksioglu, "An empirical study of RFID productivity in the U.S. retail supply chain," *International Journal of Production Economics*, vol. 163, pp. 89-96, May 2015.
- [2] W. Dutton, "Putting things to work: social and policy challenges for the internet of things," *Info*, vol. 16, no. 3, pp. 1-21, May 2014.
- [3] S. DuBravac and C. Ratti, "The internet of things: evolution or revolution?," AIG White Paper, http://www.aig.com/Chartis/internet/US/en/AIG%20White%20Paper%20-%20IoT%20English%20DIGITAL_tcm3171-677828_tcm3171-698578.pdf, April 10, 2017.
- [4] J. Bradley, J. Barbier, and D. Handler, "Embracing the internet of everything to capture your share of \$14.4 trillion," http://www.cisco.com/c/dam/en_us/about/ac79/docs/innov/IoE_Economy.pdf, March 7, 2017.
- [5] E. Fleisch, "What is the internet of things? an economic perspective," *Economics, Management, and Financial Markets*, vol. 5, no. 2, pp. 125-157, January 2010.
- [6] D. Johnson, F. Bardhi, and T. Dunn, "Understanding how technology paradoxes affect customer satisfaction with self-service technology: the role of performance ambiguity and trust in technology," *Psychology & Marketing*, vol. 25, no. 5, pp. 416-443, April 2008.
- [7] H. Waltzman and L. Shen, "The internet of things," *Intellectual Property & Technology Law Journal*, vol. 27, no.7, pp. 19-21, July 2015.
- [8] S. Kim and S. Kim, "A multi-criteria approach toward discovering killer IoT application in Korea," *Technological Forecasting & Social Change*, vol. 102, pp. 143-155, January 2016.
- [9] K. Ashton, "That 'Internet of Things' thing," *RFID Journal*, vol. 22, pp. 97-114, June 2009.
- [10] C. Peoples, G. Parr, S. Mcclean, B. Scotney, and P. Morrow, "Performance evaluation of green data centre management supporting sustainable growth of the internet of things," *Simulation Modelling Practice and Theory*, vol. 34, pp. 221-242, May 2013.

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- [11] E. Borgia, "The internet of things vision: key features, applications and open issues," *Computer Communications*, vol. 54, pp. 1-31, December 2014.
- [12] McKinsey & Company, "The internet of things: opportunities and challenges for semiconductor companies," http://www.mckinsey.com/insights/innovation/internet_of_things_opportunities_and_challenges_for_semiconductor_companies, March 22, 2017.
- [13] Y. Chang, X. Dong, and W. Sun, "Influence of characteristics of the internet of things on consumer purchase intention," *Social Behavior and Personality*, vol. 42, no.2, pp. 321-330, March 2014.
- [14] L. Gao and X. Bai, "A unified perspective on the factors influencing consumer acceptance of internet of things technology," *Asian Pacific Journal of Marketing and Logistics*, vol. 26, no. 2, pp. 211-231, May 2014.
- [15] P. Andersson and L-G. Mattsson, "Service innovations enabled by the internet of things," *IMP Journal*, vol. 9, no. 1, pp. 85-106, January 2015.
- [16] L. Winner, "Three paradoxes of the information age," In G. Bender and T. Druckery (Eds.), *Culture on the brink: ideologies of technology*, pp. 191-197, 1994.
- [17] D. Mick and S. Fournier, "Paradoxes of technology: consumer cognizance, emotions, and coping," *Journal of Consumer Research*, vol. 25, pp. 123-143, September 1998.
- [18] T. Friedman, *The world is flat: a brief history of the twenty-first century*, New York: Farrar, Straus, and Giroux, 2005.
- [19] FTC, "Internet of things," <https://www.ftc.gov/system/files/documents/reports/federal-trade-commission-staff-report-november-2013-workshop-entitled-internet-things-privacy/150127iotrpt.pdf>, January 22, 2017.
- [20] V. Venkatesh, M. Morris, G. Davis, and F. Davis, "User acceptance of information technology: toward a unified view," *MIS Quarterly*, vol. 27, no. 3, pp. 425-478, September 2003.
- [21] K. Walz, "Stress related issue due to too much technology: effects on working professionals," Johnson & Wales University, Providence, RI, 2012.
- [22] E. Karahanna and D. Straub, "The psychological origins of perceived usefulness and ease of use," *Information and Management*, vol. 35, no. 4, pp. 237-250, April 1999.
- [23] K-Y. Chen and M-L. Chang, "User acceptance of 'near field communication' mobile phone service: an investigation based on the 'unified theory of acceptance and use of technology' model," *The Service Industries Journal*, vol. 33, no.6, pp. 609-623, October 2013.
- [24] M. Lee, C. Cheung, C. Sia, and K. Lim, "How positive information social influence affects consumers' decision of internet shopping?," *Proc. 39th Hawaii International Conference on System Sciences*, January 2016.
- [25] X. Dong, Y. Chang, Y. Wang, and J. Yan, "Understanding usage of internet of things (IoT) systems in China: cognitive experience and affect experience as moderator," *Information Technology & People*, vol. 30, no. 1, pp. 117-138, January 2017.
- [26] H. Wang and S. Wang, "User acceptance of mobile Internet based on the unified theory of acceptance and use of technology: investigating the determinants and gender differences," *Social Behavior and Personality*, vol. 38, no. 3, pp. 415-426, April 2010.
- [27] T. Sundaravej, "Empirical validation of unified theory of acceptance and use technology model," *Journal of Global Information Technology Management*, vol. 13, no. 1, pp. 5-27, 2004.
- [28] C. Lin and B. Anol, "Learning online social support: an investigation of network information technology based on UTAUT," *CyberPsychology & Behavior*, vol. 11, no. 3, pp. 268-272, June 2008.
- [29] T. Sykes, V. Venkatesh, and S. Gosain, "Model of acceptance with peer support: a social network perspective to understand employees' system use," *MIS Quarterly*, vol. 33, no. 2, pp. 371-393, June 2009.
- [30] R. Gatautis and A. Medziausienem, "Factor affecting social commerce acceptance in Lithuania," *Procedia – Social and Behavior Sciences*, vol. 110, pp. 1235-1241, January 2014.
- [31] R. Ayyagari, V. Grover, and R. Purvis, "Technostress: technical antecedents and implications," *MIS Quarterly*, vol. 35, no.4, pp. 831-858, December 2011.
- [32] M. Tarafdar, Q. Tu, T. Ragu-Nathan, and B. Ragu-Nathan, "Crossing to the dark side: examining creators, outcomes, and inhibitors of technostress," *Communications of ACM*, vol. 54, no. 9, pp. 113-120, September 2011.
- [33] M. A. Fishbein, "A theory of reasoned action: some applications and implications," University of Nebraska Press, in press.
- [34] Trend E-Magazine, "Trend #6: The internet of things begins to take shape," *Trend E-Magazine*, pp. 35-40, 2014.
- [35] V. Venkatesh, J. Thong, and X. Xu, "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology," *MIS Quarterly*, vol. 36, no. 1, pp. 157-178, March 2012.

- [36] G. Sproles and E. Kendall, "A methodology for profiling consumers' decision making styles," *Journal of Consumer Affairs*, vol. 20, no. 2, pp. 267-279, 1986.
- [37] J. Nunnally, *Psychometric theory*, New York: McGraw-Hill, 1967.
- [38] J. Anderson and D. Gerbing, "Structural equation modeling in practice: a review and recommend two-step approach," *Psychological Bulletin*, vol. 103, no.3, pp. 411-423, May 1988.
- [39] R. Bagozzi and Y. Yi, "On the evaluation of structural equation models," *Journal of the Academy of Marketing Science*, vol. 16, no.1, pp. 74-94, Spring 1988.
- [40] R. Schumacker and R. Lomax, *A beginner's guide to structural equation modeling*, Lawrence Earlbaum Associated, Mahwah, NJ, 2004.
- [41] H. Lee, T. Kim, and J. Choi, "A study of the factors affecting smartphone application acceptance," 3rd International Conference on e-Education, e-Business, e-Management and e-Learning, 2012, *IPEDR* vol. 27, pp. 27-34.
- [42] K. Yang and J. C. Fomey, "The moderating role of consumer technology anxiety in mobile shopping adoption: deferential effects of facilitating conditions and social influence," *Journal of Electronic Commerce Research*, vol. 14, no. 4, pp. 334-347, 2013.
- [43] Y. C. Kiat, B Samadi, and H. Hakimian, "Consumer behavior towards acceptance of mobile marketing," *International Journal of Business and Social Science*, vol. 8, no. 4, pp. 92-105, 2017.