



# Barriers to Successful Implementation of the Internet of Things in Marketing Strategy

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## ABSTRACT

The steady rise in technological advancements has provided marketers with numerous opportunities to connect with consumers. One such innovation has been the web of interconnected devices known as the Internet of Things (IoT). However, new digital channels such as this present communication teams with both opportunities and challenges. This paper aims to bring understanding to a series of barriers that prevent marketing teams from implementing IoT strategies at scale. In addition, it examines the identified barriers through the widely used Technology Acceptance Model [1].

**Keywords:** *Marketing strategy, Internet of Things (IoT), Technology Acceptance Model (TAM), communication technology*

## 1. INTRODUCTION

Since the rise of the internet, various technological innovations including the personal computer, mobile phone, and social media have presented marketers with more opportunities to connect with consumers than ever before. This digital shift in the communication landscape has demanded a different approach to marketing strategy requiring the consideration of new mediums, messaging design, timing, and interactivity that was never before integrated in traditional marketing models. Now, as consumer technology continues to advance and be adopted at high rates by the general public, marketers must evaluate which of many evolving technologies to incorporate as a part of their overall strategy as well as to assess necessary factors for successful implementation. One such advancement that should be considered is the internet of things, which is cited to represent the third great wave of information technology after the computer and the internet [2].

The internet of things, or more commonly known as IoT [3] is defined as “a global network infrastructure, linking uniquely identified physical and virtual objects, things, and devices through intelligent objects, communication, and actuation capabilities” [4]. More simply, this term refers to how the internet is now able to connect a growing array of smart devices including connected automobiles, city infrastructure, enterprise assets, and other consumer items [5]. Both consumers and businesses have already begun to adopt IoT, and it is expected to dramatically increase throughout the next decade with experts estimating a market value of over \$2 trillion by 2020 [6]. With these high growth prospects in mind, communication professionals must evolve their marketing strategies to meet consumers through IoT. By integrating this technology into their communication plans they will be able to deepen brand relationships by:

- Collecting high volumes of consumer data to better understand consumer behavior

- Implementing algorithms to reach consumers with relevant, hyper-local messages in realtime
- Reaching customers through more personal mediums (i.e. wearable technology present on the body or smart devices located directly in the home)
- Providing additional opportunities for participative marketing, brand or product co-creation, and enhanced peer-to-peer social networking

The internet of things has been widely discussed in the literature with a focus on the technology, infrastructure, and technology suppliers [7]. However, scholarly attention to implementation of digital information technologies in the context of marketing has lagged [8]. While some research on this topic has been produced, the information regarding the critical factors necessary for implementation of IoT in marketing is highly fragmented. This study will contribute the field by grouping the various barriers to successful implementation of IoT in marketing strategy mentioned in other studies in one collective report. It will also categorize each barrier to implementation in the Technology Acceptance Model proposed by Davis (1989), which is a widely used approach for modeling adoption behavior by organizations and consumers.

## 2. LITERATURE REVIEW

The internet of things has been cited as one of the most promising innovations in information technology to date [7]. Experts conclude that it will transform and reinvigorate the consumer brand [6] because it will provide marketers with more direct, personalized contact with consumers. If marketing strategy utilizing IoT is executed properly, this positive experience with the brand can deepen relationships with consumers, enhance loyalty, and increase sales. Conversely, negative experiences are liable to produce the opposite effect, undermining brand equity and decreasing sales [9].



Despite sources citing such outcomes, no studies were located that approaches the use of IoT in marketing from a new, inclusive during this comprehensive literature review, which discussed single by analyzing the various obstacles involved in the taking a holistic approach to implementing this technology for implementation of this technology and combining them into a marketing purposes. Rather, much of what has been written regarding IoT in the marketing sphere focuses on either the individual barriers associated with IoT or brand experimentation with a singular IoT devices in specific campaigns. This is likely due to the fact that many have not yet integrated this technology as a regular part of marketing strategy. It is believed that IoT will become widely adopted in the near future, but will take time as institutions explore various technological considerations, existing network structures, and processes which are likely impact successful application of the technology [7].

### 3. METHODOLOGY

The prediction that both consumers and businesses will adopt the internet of things at scale suggests that communication professionals should gain a better understanding of how to utilize these devices to the brand's advantage. Therefore, this study

By conducting an extensive search through academic databases, ten articles related to this topic were located. In order to be included in this analysis, an article had to be sourced through the specific search criteria of "marketing + internet of things" or "advertising + internet of things." In addition, the content of each article had to make specific mention of marketing practices within the context of internet of things technology. As this is a new technology, all ten articles used in this study were written in 2011 or later. From these, seven major barriers to implementation emerged. However, as IoT technology continues to advance and additional studies are conducted, this list may continue to expand.

**Table I: Survey of barriers to implementation of internet of things in marketing strategy as noted in current literature.**

	Technology Adoption Rate	Interoperability Challenges	Data Collection and Usability Issues	Lack of Regulation; Privacy concerns	Consumer Perception	Messaging Design and Channel Challenges	Cost of Implementation
Bandyopadhyay <i>et al.</i> (2011)		X				X	
Bayler (2015)	X				X	X	X
Graham and Haarstad (2011)	X	X	X				
Jara <i>et al.</i> (2014)			X		X	X	
Kirk <i>et al.</i> (2015)					X	X	X
Mashal <i>et al.</i> (2015)		X				X	
Peppet (2014)			X	X			
Steenstrup (2013)	X	X	X			X	
Thierer (2015)	X		X	X	X		
Yaping <i>et al.</i> (2014)	X			X			



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## Barriers to Implementation of Internet of Things in Marketing Strategy

This section discusses the seven factors that are major barriers to implementing internet of things systems and connected devices in marketing strategies.

### Technology Adoption Rate

As modeled in Table I, technology adoption rate is cited as a notable barrier to IoT implementation in several articles analyzed for this study. Adoption of IoT devices by both consumers and businesses will lay the foundation for determining if marketers should integrate IoT into their communication strategies. This will not only determine whether or not marketers are able to reach consumers but will also help to predict the competitiveness of this digital space.

Initial development and use of IoT was driven by the needs of large corporations to better track products, collect data, and manage business processes [10]. Now, the internet of things is moving to the mainstream and is expected to impact various facets of business technology for a wide range of industries along with those affiliated consumer experiences [11]. However, consumer adoption rates of IoT devices have been notably low despite costly investment in research and development of IoT by businesses [12]. One study suggested that the unattractive appearance and limited functionality of current IoT devices such as wearables have hindered rapid adoption of IoT [13]. Another study concluded that a positive, interactive experience with various characteristics of the IoT device was the key variable that determined consumer purchase intention [12]. While low consumer adoption is present in the short-term, long-term growth is hypothesized as key elements necessary for the spread of IoT devices, including familiarity with automated services, data collection, and computing technology, are already present in the digital ecosystem [6]. Gartner Group estimates that by 2020, there will be up to 30 billion connected smart devices [5]. With this in mind, immediate implementation of marketing tactics utilizing IoT presents obstacles.

### Interoperability Challenges

Interoperability, which refers to the ability of different IoT objects to acknowledge and communicate with one another, is considered vital in the long-term goal of connecting objects, humans, and data and business processes [14]. Such challenges are addressed extensively in scientific studies geared toward the information technology and engineering communities. Although marketers need not necessarily understand the intricacies of the underlying technology, they must understand the basic technological framework as well as the limitations inherent with IoT at this point in time.

The internet of things is based on two fundamental principles by definition [15]. The first is that IoT is composed of a network of uniquely identifiable objects [10] that is based on a set of standard communication protocols. With this being said, several

different “standards” exist. These IoT objects and systems have evolved using a range of network technologies such as RFID, NFC, and Bluetooth in conjunction with protocols such as Zig-Bee, Z-wave, among many others. As a result, there is a marked challenge in interoperability between communication standards. In essence, this indicates that the development of numerous intricate, heterogeneous systems, which enable interoperability should be developed to ensure optimal and seamless usability for both consumers and marketers alike [15]. Furthermore, once systems for interoperability are achieved, they will need to be integrated into existing technological architectures already used by the organization and consumer [5].

### Data Collection and Usability Issues

Internet of things devices are designed to dramatically increase the available quantity and quality of data [10] as they collect and transmit information regarding their use and surroundings in real-time [13]. Users of IoT devices are not able to easily opt-out of this data transmission [16]. This type of collection enables machine-learning as well as a post-analysis of data by both the user and IoT administrator [17]. However, the type and amount of transmitted data is dependent on the specific IoT asset. A singular IoT asset may produce more than one terabyte of data per day [5], which creates a massive volume of data to evaluate, particularly among an entire IoT ecosystem composed of multiple assets. If these large sums of data are collected and interpreted, they can provide opportunities for businesses to predict and shape consumer behavior [17]. Unfortunately, it is difficult to recognize which data points are most useful in achieving this, and given the recency of the technology, the benefits of IoT data collection may only begin to appear after experimentation in which the data has already been used [13].

### Lack of Regulations and Privacy Concerns

As noted in the section above, data collection through IoT devices will take place *en masse* and potentially without consumer knowledge or active consent [13]. If the consumer is aware of the data collection and their perceived level of security is low for reasons such as outside attacks [15], it may impact their decision to utilize IoT at all [12]. Policy makers and officials are actively calling for reform, and threaten to disrupt data collection by imposing regulations to address these privacy and security concerns. While government has been traditionally slow to develop regulations surrounding technology development and use [18] should such policies come to pass, not only will businesses lose costly access to data but the development and innovative nature of IoT technology itself may suffer as a result of bureaucratic processes [13].

### Messaging Design & Channel Challenges

Many of the studies analyzed allude to the fact that the practice of marketing must continuously adjust in order to craft appropriate messages for evolving IoT mediums of different sizes, shapes, and functionalities. Although it is



clear that IoT marketing messaging will incorporate real-world activity with virtual data [17], the sheer variety present in IoT will present challenges in designing effective interactions across devices [14]. Marketers must ensure that any communications which target consumers add value to the consumer experience, placing an emphasis on message utility and timeliness [5,6].

In addition, messaging delivered through the internet of things must encourage open communication between the brand, consumers, and social networks of peers [8,14]. As in social media, this type of participative marketing cannot be fully controlled or predicted [17] and requires additional effort in maintaining brand consistency and communication [6] in even more complex, robust media channels and networks [15].

### Consumer Perception of IoT Marketing Messaging

Even if brand messaging reaches the consumer through IoT media channels, studies suggest that consumers may find the hyper-personalized advertising on these mediums invasive [13]. This negative perception may even be exacerbated in consumers born prior to 1980, who were not exposed to digital technologies until later in life [8]. It is posited that positive perception from the consumer may only be achieved through a mix of high quality customer service, continuous improvement of products and services to meet consumer expectations [17], and in the case of younger consumers, a sense of control and interactivity with the brand on their own terms [6,8]. This complexity in consumer perception will surely present difficulties in ensuring impactful interaction with consumers.

### Cost for Brands

Finally, although cited the in the fewest articles and discuss minimally, cost is a clear barrier that will impact the planning and implementation of IoT in the context of marketing. This is true because now more than ever communication professionals must strategically allocate their marketing spend [8] to attain the greatest return on investment for the organization. Currently, marketers are able plan, create, and execute other digital marketing initiatives such as social media [17], but the multivariate considerations and technical complexity of IoT communications may cause some teams to outsource these initiatives [6] which can be costly.

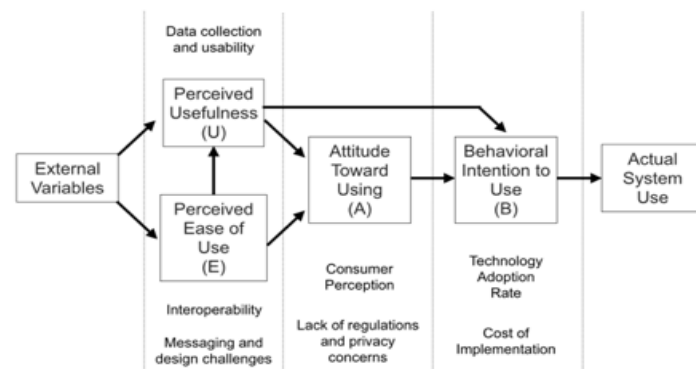
## 4. THEORETICAL MODEL

The Technology Acceptance Model (TAM) proposed by Davis (1989) will now be used in classifying the barriers to the implementation of IoT in marketing strategies as listed above. This particular information systems theory has been widely used to explain acceptance and adoption of modern technologies including online shopping [19] and car navigation systems [20] among many others.

This theoretical framework is composed of the following key constructs, which are listed below exactly as they are seen in the original TAM study. These constructs are influenced by a series of external variables and the combination of these constructs will result in a degree of actual system use.

- i. Perceived usefulness: the degree to an individual believes that using the system will help him/her attain gain in job performance.
- ii. Perceived ease of use: the degree of ease associated with the use of the system.
- iii. Attitude toward using: the individual's positive or negative feeling about performing the target behavior.
- iv. Behavioral intention to use: the individual's apprehension, or even fear, when she/he is faced with the possibility of using technology.

**Table II. IoT Acceptance in Marketing Strategy as Represented by TAM Model (1989)**



The first phase of the TAM model acknowledges that external variables will impact the key constructs of the model. These variables are beyond the scope of this research, and therefore, no barriers for IoT implementation are listed under this section. The second section of the TAM model, perceived usefulness, refers to the ability to collect and use data for marketing messaging in a meaningful way. The perceived usefulness is relevant for both the consumer, who will be contributing the data and receiving messaging, as well as the marketing team, who will analyze the data and benefit from the potential of automated and targeted messaging. If harnessed and used in an impactful way, this type of data has the ability to greatly enhance efficiencies in daily life and the workplace. Another construct, proven to impact the perception of usefulness, is the perceived ease of use. This portion involves the perception of both the marketing team and



consumer. In both cases, interoperability will present a challenge. Both parties are faced with integrating a complex world of incompatible IoT devices into their routine, which will certainly impact how useful each party may find this innovation. However, messaging design and the creation of new channels will impact marketers and consumers differently. These new channels created by IoT will present marketers with additional responsibilities and demand their understanding of even more complex media spaces. For consumers, it will provide additional opportunities to engage in brand co-creation and facilitate social connections.

Perceived usefulness and perceived ease of use will impact the next portion of the TAM model, the attitude toward using. Under this construct, both the barriers of consumer perception as well as lack of regulations and privacy concerns are listed. This is primarily due to unscrupulous data collection policies, which will result in potentially invasive messaging designed to reach variety of consumers. Given the uncertainty of outcomes at this time as presented in the literature, both consumers and marketers alike may find the use of IoT in marketing strategy to be unattractive.

The final construct, impacted by the first three, is the behavioral intention to use. After considering the various implications and difficulties in utilizing IoT devices, few consumers or marketers may actually adopt such devices and systems. The studies referenced in this research suggest potential growth, but a lack of perceived usefulness, ease of use and negative attitudes toward using, which may negatively impact the behavioral intention to implement IoT technology in regular marketing strategy.

The result of this model is actual system use. At this juncture, the results of IoT use in marketing strategy is reportedly low, and it is likely it is a result of the aforementioned constructs. Of course, studies speculate that as internet of things continues to innovate and businesses experiment with the use of this technology to reach consumers, the market will steadily increase and provide brands with unprecedented opportunity to engage with the public on terms that the consumer accepts.

## 5. CONCLUSIONS & AREAS FOR FUTURE RESEARCH

By examining the existing literature that discusses the use of the internet of things within the context of marketing, this study was able to identify several key barriers to successful implementation in marketing strategy. These barriers include a slow technology adoption rate, issues with interoperability, the collection and impactful use of big data, a lack of regulations and privacy concerns, messaging design, consumer perception, and finally, cost of implementation. As stated at the onset of this research, academic studies, which examine the application and acceptance in communication technology through the lens of marketing have

lagged, and for this reason, these barriers are by no means exhaustive and provide only a starting point for investigation. Areas for future research on this topic might include exploration of additional barriers to implementation by examining emerging literature or by conducting primary research with Chief Marketing Technology Officers or brands, which are utilizing the internet of things as a part of their digital marketing strategy. Additional information in these areas might prompt the creation of a project management plan for implementation of internet of things technologies as well as critical success factors pertinent to the marketing and communication field.

## REFERENCES

- [1]. Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-340.
- [2]. Cuimei Li<sup>1</sup>, 9., Rou Wang<sup>2</sup>, 1., & Le Huang<sup>3</sup>, b. (2014). The Key Technology and Application of the Internet of Things. *Applied Mechanics & Materials*, (644-650), 2812-2815.
- [3]. Huang, Y. and Li, G. (2010). A semantic analysis for Internet of Things. *Proceedings of the 2010 International Conference on Intelligent Computation Technology and Automation (ICICTA)*; May 11-12, 2010; Changsha, China, 1:336-339.
- [4]. Vongsingthong, S., & Smanchat, S. (2014). Internet of Things: A review of Applications and Technologies. *Suranaree Journal Of Science & Technology*, 21(4), 359-374.
- [5]. Steenstrup, K. (2013). The internet of things is moving to the mainstream. *Keeping Good Companies* (14447614), 65(11), 694-697.
- [6]. Bayler, M. (2015). The shape of things to come. *Market Leader*, (Q2), 22-25.
- [7]. Andersson, P., & Mattsson, L. (2015). Service innovations enabled by the "internet of things". *IMP Journal*, 9(1), 85-106. doi:10.1108/IMP-01-2015-0002.
- [8]. Kirk, C.P., Chiagouris, L., Lala V., Thomas, J.E. (2015). How Do Digital Natives and Digital Immigrants Respond Differently to Interactivity Online?. *Journal Of Advertising Research*, 55(1), 81-94. doi:10.2501/JAR-55-1-081-094
- [9]. Barrish, R. (n.d.). How Marketers Will Invent the New Connected Home. Retrieved April 17, 2015, from <https://www.ama.org/publications/MarketingNews/Pages/mobile-devices-gfk-z-wave-insteon-zigbee-user-experience-personalization-big-data.aspx>



<http://www.esjournals.org>

- [10]. Graham, M., & Haarstad, H. (2011). Transparency and Development: Ethical Consumption Through Web 2.0 and the Internet of Things. *Information Technologies & International Development*, 7(1), 1-18.
- [11]. Steenstrup, K. (2013). The internet of things is moving to the mainstream. *Keeping Good Companies* (14447614), 65(11), 694-697.
- [12]. Yaping, C., Xuebing, D., & Wei, S. (2014). Influence of Characteristics of the Internet of Things on Consumer Purchase Intention. *Social Behavior & Personality: An International Journal*, 42(2), 321-330. doi:10.2224/sbp.2014.42.2.321
- [13]. Thierer, A. D. (2015). The Internet of Things and Wearable Technology: Addressing Privacy and Security Concerns Without Derailing Innovation. *Richmond Journal Of Law & Technology*, 21(2), 1-118.
- [14]. Mashal, I., Alsaryrah, O., Chung, T., Yang, C., Kuo, W., & Agrawal, D. P. (2015). Survey Paper: Choices for interaction with things on Internet and underlying issues. *Ad Hoc Networks*, 2868-90. doi:10.1016/j.adhoc.2014.12.006
- [15]. Bandyopadhyay, D. d., & Sen, J. j. (2011). Internet of Things: Applications and Challenges in Technology and Standardization. *Wireless Personal Communications*, 58(1), 49-69.
- [16]. Peppet, S. R. (2014). Regulating the Internet of Things: First Steps Toward Managing Discrimination, Privacy, Security, and Consent. *Texas Law Review*, 93(1), 85-178.
- [17]. Jara, A. j., Parra, M. m., & Skarmeta, A. s. (2014). Participative marketing: extending social media marketing through the identification and interaction capabilities from the Internet of things. *Personal & Ubiquitous Computing*, 18(4), 997-1011.
- [18]. Downes, L. (2009). *The laws of disruption harnessing the new forces that govern life and business in the digital age*. New York: Basic Books.
- [19]. Ashraf, A. R., Narongsak (Tek), T., & Seigyoung, A. (2014). The Application of the Technology Acceptance Model Under Different Cultural Contexts: The Case of Online Shopping Adoption. *Journal Of International Marketing*, 22(3), 68-93.
- [20]. Park, E. p., & Kim, K. v. (2014). Driver acceptance of car navigation systems: integration of locational accuracy, processing speed, and service and display quality with technology acceptance model. *Personal & Ubiquitous Computing*, 18(3), 503-513.