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Impact of IoT on Consumer Behaviour

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Abstract

Purpose: The aim of this paper is to provide a deeper understanding of the effects of IoT on consumers' intentions and behaviours and lay the ground for future research on the perspectives and trends in marketing. Design/methodology/approach – A review of existing literature is applied as the research methodology in addition to retrieving patterns from specialized secondary sources focusing on IoT dimensions and perspectives. Findings – The research findings address insights regarding the potential impact of IoT and its components on the theories of Consumer Behaviour through all its different dimensions. The results provide an extended understanding of the antecedents and outcomes of IoT and their impact on Consumers' Behaviours and intentions. The findings reveal also what has been reached in IoT within the different disciplines of literature (social psychology, technology, commerce, economics, management, etc) that can be applied conveniently to Marketing. Originality/value – This research is the first study to handle the perspectives of IoT on consumers and its impact on their intention and behaviour. This work addresses an extended understanding of the application of IoT as a new promising technology with a brightly announced impact and future. This study adds knowledge to the existing marketing literature and provides insights into the extent of consumers' involvement in the adoption of IoT as a potential lifestyle. Finally, it supports managers and business practitioners with valuable visions in driving their business plans and strategies.

Keywords

Internet of Things, IoT, IoT applications, IoT Issues, Theoretical Background, Marketing Theories, Consumer Behaviour.

Contemporary Themes and Issues in Management and Business Research: Impact of IoT on Consumer Behaviour

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Abstract

Purpose: The aim of this paper is to provide a deeper understanding of the effects of IoT on consumers' intentions and behaviours and lay the ground for future research on the perspectives and trends in marketing.

Design/methodology/approach: A systematic Literature Review is applied as the research methodology in addition to retrieving patterns from specialized secondary sources focusing on IoT dimensions and perspectives.

Findings: The research findings address answers on how IoT and its components are going to influence the theories of Consumer Behaviour through all its different dimensions. The results provide an extended knowledge of the antecedents and outcomes of IoT and their impact on Consumers' Behaviours and intentions. The findings reveal also what has been reached in IoT within the different disciplines of literature (social psychology, technology, commerce, economics, management, etc) that can be applied conveniently to Marketing.

Originality/value: This research is the first study to handle the perspectives of IoT on consumers and its impact on their intention and behaviour. This work addresses a deeper understanding of the factors generated from the application of IoT as a new promising technology with a brightly announced impact and future. This study adds knowledge to the existing theories of marketing and provides insights into the extent of consumers' involvement in the adoption of IoT as a potential lifestyle. Finally, it supports managers and business practitioners with valuable visions in driving their business plans and strategies.

Keywords: Internet of Things, IoT, IoT applications, IoT Issues, Theoretical Background, Marketing Theories, Consumer Behaviour

1. Introduction

IoT or the Internet of Things is the technology based on artificial intelligence programs that relate multiple appliances and devices using the internet and synchronizes their responses according to their environmental requirements and changes in the most efficient way, saving costs, expenses, time, and effort (MIT, 2019). Examples of IoT are connected healthcare systems, smart sensors, connected factories, smart supply chain management, smart barcode for inventory tracking, smart power grids for smart cities, etc. IoT is present in numerous sectors such as Agriculture, Transportation, Healthcare, Manufacturing, Industry, Construction, Education, Management of Energy, Data Analytics, Data Management, etc.

IoT is regarded by literature as enabling new technologies for improving consumers' and industries'

practices (Deepak et al., 2022; Prakash et al., 2022). Such practices address important modern advantages and benefits to consumers and managers as well as optimized logistics processes (Jindal et al., 2022; Kumar et al., 2022). IoT is expected to grow rapidly and continuously from now to 2025 et beyond where the predictions announce "almost 50 billion IoT devices in 2025 will be connected to the internet with a share of four IoT devices for every person on earth" (Intech, 2022). This milestone leads to the management and the streaming of huge amounts of big data through their different interfaces involving all aspects of customers relationship and supply chain management. This new trend is touching all sectors of activities including healthcare, transportation, manufacturing, finance and banking, energy sector, agriculture, etc.

The existing literature on IoT shows a net interest manifested mainly since 2019 (Scopus, 2023). The

publication trend on the topic is quite recent and researchers' papers are most versed in International Conferences (Annex 1). In terms of academic journals, we could identify only two journals: the Internet of Things and the IEEE Internet of Things Journal.

The number of publications benefitting at least 10 citations during the last five years (2018−2022) is highlighted in Fig. 1. The maximum of citations that could be recorded within the same source of publication during this period is 144 papers. The content trend is mainly immersed in the feasibility and applications of this technology, the benefits, threats, and challenges, the architectural implementation, performance, privacy, trust, and security of the technology, and medical decision support. Details are addressed in the annexes part of this article.

In relation to Marketing literature, few studies could be found, and the latter has linked IoT to the management of customer relationships, business intelligence, product design, and improvement through the exploitation of IoT data, information, and insights on customers' reactions, behaviour, use, and feedback collected through the interaction with IoT systems. Such intelligence helps to granulate the providers' and suppliers' understanding vis a vis their customers (Taylor & Wren, 2020). IoT is also used by marketers to enhance the client experience and improve their service interaction and customer involvement with smart objects (Keng et al., 2023). On the other hand, the literature achievements in the research of consumer intentions and behaviours have shown that the spread of IoT use and smart gadgets is raising concerns about online users' data privacy and negatively impacting their behaviours toward retraction (Adebiyi & Olayemi, 2022). Further to this, the core-technological characteristics of societies exercise a significant weight on consumers'

lifestyles and their decision to purchase these products and services. The impact can be extended beyond the existing brands to reach new alternatives to consumers' expectations and product adoption that could be reached through new strategies of marketing conducted in the same marketplaces (Kushwaha et al., 2015).

The future trends of technological systems, as highlighted by (Mishra & Awasthi, 2022; Paliszkiewicz and Gołuchowski, 2022) present significant opportunities, challenges and risks that will impact consumers' psychology, use and purchase perspectives. These cannot be left without any changes in consumer satisfaction and attitudes (Lawal & Binuyo, 2022). Also (Mishra & Shukla, 2020), demonstrated that technology adoption is driven by sociological and psychological attitudinal features of consumers and underscored the outcomes reached by (Dwivedi et al., 2019) while re-exploring the Unified Theory of Acceptance and Use of Technology (UTAUT). Such outcomes specify the tremendous role of attitude in accepting and adopting information systems and technology innovations. Additionally (Ajayi et al., 2022) stated that "despite multiple research (Capatina et al., 2020; Davenport & Kalakota, 2019; Ting et al., 2019) emphasizing the impact of IoT on marketing strategies and consumer behaviour; there are still gaps that need to engage empirical studies to analyse consumer engagement in the context of smart service systems" (Ajayi et al., 2022).

Therefore and driven by the limited research in the existing IoT literature and their potential impact on marketing dimensions, this research paper seeks to answer the following research questions:

RQ1. How IoT and its components are going to influence the theories of Consumer Behaviour through all its different dimensions
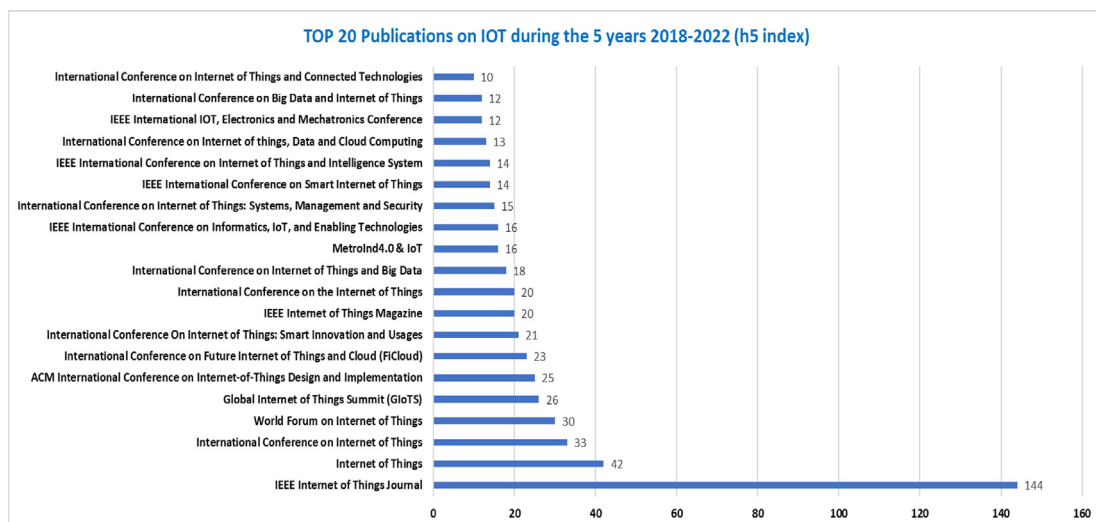

Fig. 1. Distribution of IoT TOP 20 publications during the last 5 years.

RQ2. What are the antecedents and outcomes of IoT impact on Consumers and their Behaviours (IoT effect on purchase intention, consumer retaining, supply value chain to the consumer, consumer adoption of IoT, etc.)

RQ3. What has been reached in IoT within the different disciplines of literature (social psychology, technology, commerce, economics, management, etc) that can be applied and be advantageous for Marketing? An extended Literature Review.

2. Literature review, and research gap

(Wu et al., 2019) placed IoT as an outcome of Blockchain applications and associate its deployment with four main determinants which are a combination of devices, Architecture of systems, Data Management, and Data Security. To understand the adoption and willingness of consumers to pay for the internet of things services (Kasilingam & Krishna, 2022), coped with developing a model founded on the Theory of Reasoned Actions. The model explains and tests the relationship between Willingness to pay for Internet of Things services, Attitude, and Intention to Use through a series of values which are: Perceived playfulness, Experiential value, Social, Emotional, Epistemic, and Convenience values. These constructs were found to be the most significant variables affecting attitude and intention to use IoT services with the intervention of moderating role of age, gender, and income. Such results are promising; however, they are addressed with a significant number of limitations. Among these limitations, is the validation of the tested model which studies the determinants to use a technology that is not yet spread in society. Respondents are not real users of IoT; so, to cope with this constraint the authors have shown a video explaining IoT services to support the respondents in answering the questionnaire. In this context, the representative outcomes and conclusion may differ if respondents were real users who experienced such technology and services and developed real feedback. Another limitation is related to the generalization of results as this model was tested and validated only in one country. Applying to other countries' contexts would provide further insights. (Kasilingam & Krishna, 2022) stated also that this study is the first in its kind with the aim to investigate quantitatively (a sample size of 1623 respondents through simulation) the determinants of IoT adoption and use.

The study (Kim & Park, 2022) handled IoT from a consumer resistance perspective. They deemed to explain consumer intention to not use IoT in the future by supporting it with a resistant attitude which itself is supported by perceived risk and perceived benefit decomposed respectively into privacy concern & perceived trust, and perceived trust & perceived ease of use. One further research in this area would be recommended as IoT applications and their deployment do not depend only on consumers' reactions and resistance as they depend also on the accessibility of the technology to consumers and the facilitating conditions to use it. The collection of sufficient and unbiased data to measure the consumer's resistance through extended lenses of further constructs needs to be looked at (Chen et al., 2014) present some challenges that IoT is faced with. The interesting one in this work is related to the fact that IoT lacks "theory, and standards that integrate the virtual world and the real physical world in a unified framework".

(Park et al., 2017) claimed that only a few studies have examined the fundamental elements of consumer acceptability of IoT technologies in settings like smart homes and the user experience of such technologies. The authors put in place a model that included a technological acceptance model and five potential user considerations. The findings demonstrate that desire/motivation, compatibility, connectivity, control, negative impediment, and cost play a key role in influencing how people accept the new technology of IoT.

In a tentative to analyse consumer behaviour in IoT environments (Htun & Tin, 2021), proposed a "search behaviour analyser that examines image searching behaviour using consumer technologies". The suggested method evaluates visual data for customers' intent to rank the significance of various technologies. The authors proposed axes for future research to focus on further user-oriented social media signals and feature extraction for picture content similarity measurements on web databases. Potential findings in this regard will improve the development of real-life consumer behaviour analysers.

Within the healthcare systems (Hussain & Muhammad, 2018), stated that the use of IoT has enabled connected healthcare services while providing efficient solutions and healthier management. But, they remain challenged by the fact of not considering emotional care, notably for special categories of people like kids, old, and mentally ill people. To overcome this, the authors proposed an emotion-aware connected healthcare system using a powerful emotion detection module.

In an empirical analysis of IoT from a consumer behaviour perspective with a focus on India (Chatterjee, 2020), conceived a theoretical framework based on the theory of Planned Behaviour and De Lone and Mc Lean model. The authors tested and

validated a model that explains the actual use of IoT by Perceived Intention to use (PIU) and Word of Mouth (WOM). At the same time Socializing, Recommendation, Perceived Information Quality, Perceived Service Quality, and Perceived Satisfaction of Users consist of antecedents to PIU and WOM.

On the open issues of IoT (Xu et al., 2018) addressed the IoT analysis of performance, design optimization, and combination of IoT with other technologies.

To the best of our knowledge, and based on the analysis of the existing literature, we could identify only a few studies dealing with Consumer Behaviour and IoT concern through empirical thinking (Park et al., 2017; Chatterjee, 2020; Kim & Park, 2022; Kasilingam & Krishna, 2022; Rajkumar et al., 2022; Sanwal, 2022; Treves, 2022). The theories of these papers are quite diverse with the use of TPB, Theory of Reasoned Action, Technology Acceptance Model, Innovation Diffusion Theory and De Lone and Mc Lean model. Except for these papers, we could note a scarcity of quantitative research, and the use of theoretical frameworks within the existing literature. The research on IoT remains constrained by the limited number of publications and academic journals' interest.

3. Contributions

The existing literature on IoT and its impact on consumers is oriented into conference proceedings works. We could note a minimal number of journals handling IoT with theoretical marketing dimensions. In recent years, the focus of IoT importance has shown a growing interest highlighted by its promising expansion and deployment perspectives (Intech, 2022). Such a promising future would generate changes in society's lifestyles and consumer behaviours. Thus in addition to the present findings in the existing literature, this paper addresses the significance to investigate the role and impact of IoT exploding technology from the theoretical marketing lenses. It enhances the available theoretical background in marketing with valuable insights on the constructs that could add knowledge to the IoT background, dimensions, and future trends. By dimensions, we mean purchase intention, consumer retention, brand management, supply value chain to the consumer, consumer adoption of IoT, etc. From the practice lens, this study's findings support business users with insights into the impact of IoT on their lifestyles and future developments. For business decision-makers, it offers valuable knowledge on how to take advantage of this promising technology and guides them toward an efficient path in deploying IoT in the most advantageous way that adds value to both customers and business practitioners.

4. Directions for future research and potential avenues

In consideration of the literature findings and proposed research questions, it is highly recommended to dig deeper into Consumers' perception toward IoT applications and deployment, their added value, opportunities, and challenges as well as their impact on lifestyles. Using different countries' focus and diversifying the research designs as well as unbiased primary data collection are advised to identify the factors that can affect the use of IoT and the consumer perspectives towards reticence or real adoption of this technology, its products, and services as well as its repercussions and downsides.

This span of research is recommended at a time when IoT is expected to grow rapidly from now to 2025 with an estimation of fifty Billion IoT-connected devices in 2025 with a share of 4 devices for every person (Intech, 2022). The expected growth and rapid deployment of IoT is also stimulated by the post-pandemic covid 19 period which is impacting directly the consumers' habits and expectations (Kasilingam & Krishna, 2022) (Sun, 2022).

This milestone leads to the management and the streaming of huge amounts of big data through their different interfaces involving all aspects of customers relationship and supply chain management (Xu et al., 2018) and adaptation toward new business models and market places (Tripathy & Anuradha, 2018; Vermesan & Friess, 2022).

Avenues for future research can be oriented into investigating the influence of IoT on both organizational and individual levels as a potential area that will enlighten the path for a better understanding of the near future technology impact on consumers' lifestyles and businesses' perspectives.

The potential outcomes will feed marketers and business makers to design business strategies that support the successful deployment of IoT adoption/use with a good degree of consumer satisfaction and acceptance. Such results would support both literature and practice. In literature, it will support researchers with developing theoretical backgrounds and reviewing existing theories that incorporate the impact of IoT as a new technology in the research capital and enrich the knowledge reigning the implementation of modern technologies. Literally, this will support the existing literature with the novel theoretical framework and seek further validation for the generalization of the existing results.

In practice, it will equip business managers and decision-makers with the scientific evidence to support the success of their performance in wealthy-healthy environment and optimize their generated

values in a speedy evolving environment that deals
with dynamic and promising technologies.

5. Annexes
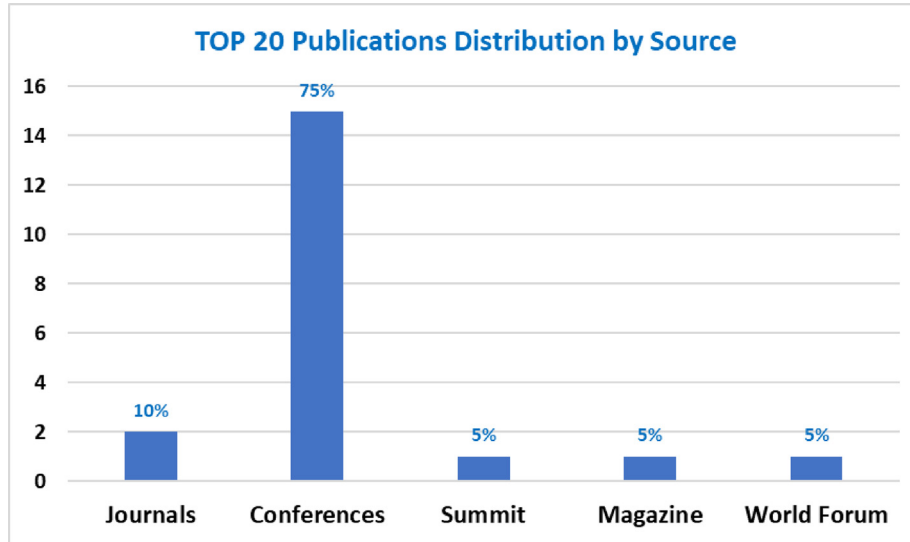
The last 5 years: 2018−2022 record in the TOP 20 Publications (cited at least 10 times), 2 Academic Journals, 25 international conferences, 1 Summit, 1 World Forum, 1 Magazine.

#	Paper	Method/Approach	Theory	Model	Dep. Variables	Ind. Variable	Authors	Country Focus
1	(Wu, et al., 2019)	Technical paper	-	-			Wu, Wang, Cai, Guo, Rong	-
2	(Chen, et al., 2014)	Conceptual paper	-	-			Chen, Xu, Liu, Hu, Wang	China
3	(Park, et al., 2017)	Quantitative	TAM	Validated	Intention to use	Perceived cost; Attitude	Park, Cho, Han, Kwon	South Korea
			Innovation Diffusion Theory		Attitude	PU, PEU		
						Perceived connectedness, Perceived Enjoyment, Perceived Control, Perceived Compatibility		
4	(Htun, et al.,2021)	Machine Learning	-	-	-	-	Htun, Zin, Tin	-
5	(Hossain and Muhammad, 2018)	Big Data Analysis	-	-	-	-	Hossain, Muhammad	-
6	Lenora, 2021	Critical Review	-	-	-	-	Lenora	-
7	(Kasilingam and Krishna, 2022)	Quantitative	TRA	Validated	Willing to Pay	Attitude, Intention to use	Kasilingam, Krishna	India
					Intention to use	Perceived playfulness, Experiential value, Social, Emotional, Epistemic, and Convenience value		
					Attitude	Perceived playfulness, Experiential value, Social, Emotional, Epistemic, and Convenience value		
8								
9								
10								
11								
12								

Main Characteristics of the consulted LR in relation with the adoption of IoT.
Note: The table is not exhaustive.

TABLE A1   Literature on the internet of things adoption

Authors (Year)	IOT technology	Sample	Theories	Variables
Bai and Gao (2014)	Electronic Toll Collection (ETC)	368 Responses/ Experienced ETC Users	Technology acceptance model	Usefulness, Ease of use, Trust, Social influence, Enjoyment, Behavioural control
Karahoca et al. (2017)	Health Care Smart Device (Smart Shirt and Smart Band)	426 Responses	Technology acceptance model, Innovation diffusion theory, Technological innovativeness, Protection motivation theory, Privacy calculus theory	Advantage, Innovativeness, Compatibility, Trialability, Image, Vulnerability, Severity, Risk, Cost, Ease of use, Usefulness
Shin (2017)	Activity Trackers	95 Responses	Theory of reasoned action, Theory of planned behaviour, Quality of Effects	Content quality, System quality, Service quality, Hedonism, Utility, Satisfaction, Coolness, Affordance
Chatterjee et al. (2018)	Smart Cities	244 Responses	Information Success model	Information quality, System quality, service quality, Intention to use, Satisfaction, Actual use, Net benefit
Martínez-Caro et al. (2018)	Healthcare Information Systems	256 Responses	Self-developed model	Innovativeness, Self-efficacy, Usefulness, Satisfaction
Roy et al. (2018)	Smart Retail Technology	361 Responses	Technology readiness and technology acceptance model	Technology readiness, Usefulness, Ease of use, Superior functionality, Adaptiveness, Store reputation
Shin et al. (2018)	Smart House	310 Responses / Smart phone users	Technology acceptance model	Compatibility, Privacy, Ease of use, usefulness, gender, income, number of existing devices
Sivathanu (2018)	Wearable Healthcare Devices	815 Responses	Behavioural reasoning theory	Convenience, Ubiquitous, Relative advantage, Compatibility, Reasons against Usage barrier, Risk barrier, Traditional barrier, Openness to change
Yang et al. (2018)	Smart Homes	216 Responses	Self-developed	Automation, Controllability, Interconnectedness, Reliability, Residence type
Yildirim and Ali-Eldin (2018)	Smart Watch	76 Responses	Theory of reasoned action, Technology acceptance model	Privacy, Risk, Ethics, usefulness,

Source: (Kasilingam & Krishna, 2022)

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