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The Impact of the Internet of Things on Marketing Proceedings

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October 2023

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Acknowledgments

To my professors, for all the help; To my Family, for all the support.
And to my Boyfriend, for all the patience.

Resumo

A Inteligência Artificial está a emergir como um interveniente fundamental em diversos domínios, obrigando todas as organizações e estruturas a adaptarem-se e a melhorarem o seu desempenho (Vardarlıer & Zafer, 2020: 355). Este estudo pretende avaliar como a integração da Internet of Things nas interações entre consumidores e produtos/serviços afeta a satisfação, fidelidade, jornada do cliente, expectativas de conveniência e eficiência, bem como a personalização das mensagens de marketing. Para isso, este estudo responde a três questões de pesquisa. A primeira relaciona-se com o impacto da integração da IoT na satisfação do consumidor e a sua subsequente fidelidade à marca, a segunda relativa à influência da IoT em cada estágio da jornada do cliente e a terceira está relacionada com a influência da IoT nas expectativas do consumidor em relação à conveniência e eficiência nas etapas de compra e uso de produtos, e quais são as principais mudanças nas perceções e demandas do consumidor relacionadas à IoT.

Para obter conclusões relevantes, foi feita uma revisão de literatura relativa a todos os temas, assim como uma análise estatística de um questionário online. Os resultados obtidos mostram que efetivamente a IoT deve ser integrada na relação entre o consumidor e produto/serviço, existindo um significativo aumento da disposição dos consumidores a esta tecnologia ao longo dos anos. Com esta base, são retiradas conclusões que confirmam o elevado valor da IoT na jornada de compra, bem como a confirmação de que as empresas devem investir nos processos de Marketing relativos à IoT .

Palavras-Chave: Internet das Coisas, Marketing e IoT e Experiência do cliente

Classificação JEL:

M10 Business Administration: General
O31 Innovation and Invention: Processes and Incentives
M31 Marketing

Abstract

Artificial Intelligence is emerging as a key player in several domains, forcing all organizations and structures to adapt and improve their performance (Vardarlıer & Zafer, 2020: 355). This study aims to assess how the integration of the Internet of Things into interactions between consumers and products/services affects satisfaction, loyalty, the customer journey, expectations of convenience and efficiency, as well as the personalization of marketing messages. To this end, this study answers three research questions. The first relates to the impact of the integration of the IoT on consumer satisfaction and subsequent brand loyalty, the second relates to the influence of the IoT on each stage of the customer journey and the third relates to the influence of the IoT on consumer expectations regarding convenience and efficiency in the stages of purchasing and using products, and what are the main changes in consumer perceptions and demands related to the IoT.

In order to obtain relevant conclusions, a literature review was conducted on all the topics, as well as a statistical analysis of an online questionnaire. The results obtained show that IoT should indeed be integrated into the relationship between the consumer and the product/service, and that there has been a significant increase in consumer willingness to use this technology over the years. On this basis, conclusions are drawn that confirm the high value of IoT in the purchasing journey, as well as confirming that companies should invest in marketing processes related to IoT.

Keywords: Internet of Things, Marketing and IoT and Customer Experience

JEL Classification:

M10 Business Administration: General
O31 Innovation and Invention: Processes and Incentives
M31 Marketing

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List of Abbreviations

AI – Artificial Intelligence

DL – Deep Learning

EU – European Union

GPS – General Problem Solver

IoT – Internet of Things

M2M – Machine to Machine

P2P – Peer-to-Peer

RAA – Rational Agent Approach

Chapter I – Introduction

The theme "The Impact of the Internet of Things on Marketing Procedures" deals with the relevance of understanding & examining the interactions between facts and phenomena arising from the Internet of Things (IoT) and marketing. To develop the benefits that the IoT can bring to society, bibliographical research was conducted in areas such as technology, marketing, communication, and sociology.

Descriptive surveys were conducted to collect data and gauge the expectations of laypeople and experts regarding the IoT and communication from different brands, with the aim of applying the concepts and studies analyzed to the current reality of 2017 and the near future. Applied research was used to assess the importance of communication and how consumers react to these stimuli. This enabled the creation of IoT marketing strategies that consider products, place, price, and promotion.

Kevin Ashton, a researcher at MIT, used the term "Internet of Things" for the first time in 1999 to describe his idea of facilitating production chain logistics and electronically tagging clothes. Although the term was defined in the early 2000s, the concept of the Internet of Things (IoT) began to be used to make predictions. By analyzing current and developing technologies, it was possible to determine an approximate timeframe of twenty years for the scope of the work.

The Internet of Things can significantly alter marketing processes, as it allows subjects to be segmented into the four "Ps" of the marketing mix. Studies show that the Internet of Things can help most, if not all, marketing methods. Real-time identification and tracking protocols can improve product delivery and the relationship between brand and consumer.

In short, studying the effects of the Internet of Things on marketing procedures is essential to understanding how technology can improve marketing efforts, divide the target audience, and meet consumer expectations regarding communication from different brands. The Internet of Things offers new ways of interacting and learning, and it is essential that marketers are aware of these developments to use technology to their advantage.

1.1 Objectives and Research Problem

According to the literature review, the adoption of AI by businesses helps them maintain competitiveness in the market through the desire to gain a competitive advantage, which is the most important economic factor for them. Consumers have better attitudes and purchase intentions towards environmentally sustainable products due to awareness of climate change and resource scarcity, issues in our daily lives (Amaral, 2021).

Once an organization needs to change its strategic alignment based on the implementation of innovative technologies, all functions of the company must follow this same strategy. Therefore, since there is no research on this topic, this thesis aims to analyse the impact of using IOT in marketing. This would compensate for the lack of research done on the synergy of the two concepts.

This thesis aims to answer two specific theoretical objectives, using three research questions. But within the general scope of this research, it aims to make a positive contribution to these research fields, specifically the field of intelligent systems development and the field of renewable energy projects. Thus, this project will be a constructive addition to the existing literature on the above topics.

The objectives and corresponding research questions will be explained below as follow:

I. Comprehensively assess how the integration of the Internet of Things (IoT) into interactions between consumers and products/services affects satisfaction, loyalty, customer journey, expectations of convenience and efficiency, as well as the personalization of marketing messages.

   a. How does the integration of the Internet of Things (IoT) affect consumer satisfaction and subsequent brand loyalty?
   b. How does IoT influence each stage of the customer journey, from the product discovery phase to the purchase and after-sales support experience?
   c. How is IoT influencing and shaping consumer expectations regarding convenience and efficiency in the stages of buying and using products, and what are the main changes in consumer perceptions and demands related to IoT.

1.2 Dissertation Structure

The composition of this dissertation is as follows: The foundation for this study and the research challenge from which it originated are presented in chapter I, the introduction. Every subject examined in the study is presented in Chapter II, the literature review. This thorough analysis of the existing literature covers a wide range of issues, including marketing, artificial intelligence, intelligent systems, internet of things, and IoT architecture. It aims to clarify how each technology or project works and how connections between them are made.

Following the review of the literature, the goals, connecting themes, and hypotheses from the preceding chapter are presented in Chapter III, the theoretical approach.

The study model and the connection between each survey question and its indicator are covered in Chapter IV, "Methodology." The result presentation and discussion with the writers listed in the literature review are covered in Chapter V. Here, the research questions are confirmed, and an integrated discussion of the findings is also conducted to comprehend the connections and mutual influences of the previously given issues. The study's conclusions are finally presented in Chapter VI, along with a discussion of its shortcomings and recommendations for more research.

Chapter II – Literature Review

2.1 Intelligent Systems

According to the Stanford University's Artificial Intelligence Index Report of 2021 (Zhang et al, 2021), the world is observing an increase in interest in AI. The number of journal publications has increased by 34.5% from 2019 to 2020, and while most publications come from academic institutions, interest has also increased in governments (15.6% in China and 17.2% in the EU) and in the corporate world (19.2% of total publications in the US). For the general public, interest in AI, measured by the attendance of AI related conferences where the multiple benefits of intelligent technologies are shown has almost doubled in 2020, although this difference may be partially explained by the Covid19 pandemic, which forced these conferences to be held online.

Siau and Wang (2018) refer that several factors are important to understand trust in IS. To form initial trust, it is important to show transparency and to have a superior performance. To maintain confidence, aspects such as reliability, security, and interpretability is essential. Also important is the perception of the purpose of these systems, since some people may show distrust due to the fear of losing their jobs, or regarding the science-fictional aspect of AI – the eventual overcoming of human intelligence and subsequent destruction of society.

Another important factor regarding user trust in Intelligent Systems is the perception of the inner workings of AI. A study by Holliday et al (2016) demonstrates that users tend to show more confidence in these systems if explanations are given about how results are obtained. We will now define IS and explain the various components necessary for their existence.

There are several definitions regarding Intelligent Systems. Authors Stuart Russell and Peter Norvig (2010) describe them as agents which perceive their environment through sensors, and act upon it through effectors. More recently, Molina (2020) describes these systems as tools operating in a complex world with limited resources, and which possess cognitive abilities like perception, reasoning, action control, or language use. According to the same author, these systems exhibit an intelligent behavior, supported by abilities such as rationality, adaptation through learning, and introspection in order to explain the use of their knowledge.

An equally important characteristic of Intelligent Systems is their autonomy. These systems are able to make decisions on their own, choosing the best available course of action by learning from their previously obtained knowledge. Leikas et al (2019) describe autonomous systems as going beyond automation, adding self-governing behavior, and requiring intelligent decision- making abilities. But for systems to be autonomous, they cannot simply be programmed by their creators. They need the technology that enables this sort of rational thinking and learning that was for centuries only available to humans: they need Artificial Intelligence.

2.1.1 Artificial Intelligence

Artificial Intelligence as a discipline has its origin in 1956, when the term was coined at the Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI), hosted by John McCarthy and Marvin Minsky. Until today, definitions of the term have varied greatly. Russell and Norvig (2010) describe AI as systems divided into four categories: systems that think or act like humans, and systems that think or act rationally. Another definition is provided by McCarthy himself in 1956, saying that as every aspect of intelligence can be accurately described, so too can it be simulated by a machine.

Although AI has been studied and developed for more than half a century, its real applications and benefits were always under discussion. It was not until 1997 that something remarkable changed the idea about the discipline all over the world. That was the year in which Deep Blue, IBM's chess playing intelligent system, defeated the then world chess champion Garry Kasparov. According to McCorduck (2004), there was a realization that computers that fused "minds" and sensors were able to perform tasks previously thought to be unique to humans, and that intelligence was finally in the reach of machines.

As previously mentioned, Russell and Norvig described four types of categories for AI. The first one, Thinking Humanly, is based on cognitive science. The authors considered that if we understand the functioning of the human mind (through introspection or psychological experiments), we can accurately express it as a computer program. The work of Newel and Simon (1961) is used to express this reasoning, as these authors created the GPS (General Problem Solver), a computer program designed to solve

any general problem that could be put into symbolic terms. However, Newel and Simon where more focused on using the GPS as a theory of human problem-solving, rather than a simple computer program.

The second category of AI for Russell and Norvig is Acting Humanly. This is based on the work of British mathematician Alan Turing (1950), who designed the Turing Test. This test sought to capacitate machines to achieve intelligent behavior, described by Turing and according to Russell and Norvig as "the ability to achieve human-level performance in all cognitive tasks, sufficient to fool an interrogator*"* (2010). The same authors refer that in order to obtain this level of performance, the machine would need four main capabilities. They are *Natural Language Processing*, to successfully communicate in any human language; *Knowledge Representation*, for storing information; *Automated Reasoning*, to draw conclusions and answer questions from the information stored; and *Machine Learning*, to adapt to new circumstances and to extrapolate new patterns.

The third category from Russell and Norvig is Thinking Rationally. This is based on the Laws of Thought Approach, which derive from logical thinking (with its origins in Aristoteles' syllogisms and rational thinking). This approach proposes that machines would take any problem described in logical notation, i.e., mathematical symbols, and find an appropriate solution given enough time. This, however, poses two problems: first, it is not easy to describe every problem as logical notation, because complex problems may not have an answer that is 100% certain. Second, some problems may be so complex that machines would not have the skills or the time to solve them accurately if they were not provided with some sort of guidance as to which steps it should take first.

Finally, the Rational Agent Approach (RAA) brings us to the fourth category described by Russell and Norvig: Acting Rationally. This is the most important and relevant category, considering that an agent that acts rationally englobes the characteristics of the three previous categories. According to the authors, acting rationally implies acting concordantly with your beliefs in order to achieve your goals. An agent, therefore, must act given into account what it perceives – and AI is then viewed as the study and construction of rational agents.

As mentioned, the Rational Agent Approach englobes the other categories. This is because, for instance, the cognitive skills implied by the Turing Test are there not only to fool the interrogator, but also to allow rational and logical actions and reactions to his or

her questions. All the cognitive knowledge that a machine may have, could be used not only to pass a test, and solve complex problems, but also for it to learn how to adapt and improve itself in face of ever- changing environments and situations.

Regarding the Laws of Thought Approach, in which logical and correct inferences are necessary to reach the "right" conclusions, the RAA goes further because it sees that making correct inferences is not the entirety of rationality (Russell and Norvig, 2010). There are some situations in which there is no one correct solution, and yet something must be done. A machine must be able to decide based not only on rationality, but also based on its prior knowledge and future predictions regarding its actions.

We now have a somehow sufficient knowledge on the foundations of AI and its many possible definitions. It is time, then, to go deeper into the possible uses of this technology and understand how it may be used by machines to learn and improve their own capabilities. We will therefore mention Machine Learning, the technology that can be used to, according to Singh et al (2020), identify patterns and make predictions based on data generated by any system. These possibilities will be extremely useful ahead, when we mention the integration between the Energy sector, Peer-to-Peer (P2P) Systems, AI, Machine Learning, Big Data, and the Internet of Things. But let us not get ahead of ourselves – for now, our focus is Machine Learning.

2.1.2 Internet of Things

The phrase "Internet of Things" (IoT) was probably coined in 1999 by Kevin Ashton (2009) as the title of his presentation at Procter & Gamble, according to himself. Since then, many definitions have been given to the term IoT. We will make use of the words from Sethi and Sarangi (2017), who refer, quite simply, that the IoT is a new kind of world, in which the majority of devices and appliances used by humans are connected to a network. The same authors state that these objects may be used collaboratively, in order to achieve complex tasks requiring a high degree of intelligence.

But before we define the concept of IoT, a word about user trust is important. User trust in the IoT is mostly concerned with privacy and security (Rose et al, 2015; Abera et al 2016; Lin and Dong 2018). According to Rose et al (2015), users of the IoT need to be assured that their data is secure as it travels through interconnected devices, much in the

same way in which we trust that browsing the Internet is safe and that our data is private and anonymous. Abera et al (2016) show the need to verify that remote IoT devices are properly functioning and behaving as expected, and Lin and Dong (2018) mention several ways for trust to be ensured in the IoT, such as feedback from other users, reputation of the service providers, or the context of the transactions.

Moving on, it would be unfair to talk about the IoT without mentioning an essential concept for its existence. Machine-to-Machine (M2M) is described by Holler et al (2014) as a solution that enables communication via wired or wireless networks between devices that share the same types and specific applications. The authors also state that these solutions make it possible for users to capture data about events from their devices and gives the examples of temperature or inventory levels. Other possible applications are mentioned by Fadlullah et al (2011), who claim that with efficient M2M communication, an electric grid may have enough smart capabilities to allow the players in the power management system to maintain near-real-time awareness of each other's requirements and capabilities.

To distinguish IoT from M2M, Holler et al (2014) state that the IoT encompasses M2M, but it also refers to the connection of intercommunicable systems and sensors to the Internet, as well as using general Internet technologies. The IoT is, therefore and according to Lin et al (2017), an extension of the Internet, which means that in the IoT multiple networks should coexist and offer an interoperability among networks which is essential for information delivery and for the support of the many applications the IoT may provide. To understand these applications and features, it is important to explain the most suggested architectures for the IoT. Before that, a small description of Big Data is necessary, since this concept deeply influences the architectures to be discussed.

2.1.3 IoT Architecture

An interesting, proposed architecture is given by Ning and Wang (2011). The authors suggest a "Man-like Nervous" model, which consists of three parts: the brain, for management and as a centralized data center; the spinal cord, as distributed control nodes; and a network of nerves, which are the IoT networks and sensors. This proposal is

interesting for its simplicity and resemblance to the human body, but it is, however, quite insufficient.

Better proposals are mentioned by Sethi and Sarangi (2017), consisting of architectures with either three or five layers. The three-layer architecture is comprised of the *perception*, *network*, and *application* layers, and data flows in this order. The first (perception) is physical, with sensors that gather information about the environment by sensing physical parameters or identifying smart objects around them. The second (network) is responsible for the connections with other smart objects in the network, and it transmits and processes sensor data. Finally, the third layer (application) is where specific application services are delivered to the user, with the example of smart homes or smart cities.

For the five-layer architecture, the same authors (Sethi and Sarangi, 2017) explain that three layers are added, and network is removed. Keeping the same order for the data flow, a *transport* layer is added after perception, and it is where the sensor data is transferred to the next layer, *processing*. Here, data is stored, analyzed, and processed by technologies such as cloud computing or big data processing modules. Finally, the *business* layer is added after application, and it is where the whole IoT system is managed, including business/profit models and users' privacy.

There are, however, some limitations to these architectures. In the systems described above, data is processed and analyzed mostly through cloud computing technology. But the main constraint of this systems is their limitation in terms of the capacity for processing large volumes of data. According to Varghese and Buyya (2018), the increased availability of devices equipped with sensors, such as smartphones, tablets, or wearables, is generating such volumes of data that the cloud computing infrastructure needs to evolve and requires new computing models to satisfy large-scale applications.

Due to this limitation, an architecture for the IoT based on fog (or edge) computing is proposed. Although fog and edge computing are slightly different concepts, their main characteristics are quite similar. Li et al (2018) define edge computing as the offloading of computing tasks from the centralized cloud to edge nodes near the IoT devices, which allows for the pre-processing of data in the edge, drastically reducing the amount of data that is transferred from these devices to the cloud. Sethi and Sarangi (2017) refer that fog computing may be seen as a sort of cloud where data is pre-processed, but close to the ground and near the IoT devices. This is achieved through a strong communicability

between devices on the edge of the network, and by giving smart data pre-processing capabilities to physical devices.

We will use these two concepts interchangeably, since the goal of both is to pre-process data before it is transferred to the cloud. As Lin et al (2017) mention, given the increase in generated data, fog/edge computing may provide computing and storage services to the devices (or nodes) at the edge of the network, thus removing pressure from the center of the cloud. Another advantage is mentioned by Li et al (2018), who show us how technologies like Deep Learning may optimize network performance in the edge computing environment, as well as protect user privacy when data is uploaded.

Li et al (2018) claim that since DL can find features and patterns in large amounts of data, it is appropriate for edge computing because it reduces the load sent to the cloud by learning common features in data sets provided by the edge devices. For privacy purposes, DL may preserve the privacy in intermediate data transferring because it is harder to understand the original information when given the patterns and features extracted by Neural Networks, according to the same authors. Another way to ensure privacy and security when transferring data is the developing technology of Blockchain. The next chapter addresses this model and gives an insight into how it may be applied and improve networks among the IoT.

2.2 Internet of Things and Marketing

A revised version of the definition of marketing was approved by the American Marketing Association in 2013. The association defines marketing as the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging products and services that are valuable to customers, clients, partners, and society at large ("What is Marketing? — The Definition of Marketing — AMA", 2019).

Marketing research is a function that connects consumers, customers, and the public with marketers through information—information used to identify and define opportunities and problems, generate, refine, and evaluate actions, monitor performance, and improve understanding of the process in general. It specifies the information required to address these issues. It designs the method for collecting information, manages and implements the data collection process, analyses the results, and communicates the findings and their implications. ("What is Marketing? — The Definition of Marketing — AMA", 2019).

The crucial aspect of marketing is the value provided to the customer (Grönroos, 2006), where the customer value can be in the form of goods, ideas, services, information, or any other type of solution that meets the customer's needs.

McCarthy proposed the idea of a “marketing mix” as a conceptual framework for translating marketing planning into practice (Bennett, 1997). Though the marketing mix is not a scientific theory, its tools can be used to develop both long-term strategies and short-term tactical marketing programs (Palmer, 2004).

McCarthy refined Borden's vision of satisfying the target market. He regrouped Borden's 12 elements (product planning, pricing, branding, channels of distribution, personal selling, advertising, promotions, packaging, display, servicing, physical handling, fact-finding, and analysis) into four elements, called the 4Ps: product, price, promotion, and place. There were further advancements made within the marketing mix concept, such as adding another Ps - people, processes, and physical evidence (Booms, Bittner, 1980), though the idea of 4Ps is still widely used and accepted.

A product is defined as a bundle of attributes (features, functions, benefits, and uses) capable of exchange or use, usually a mix of tangible and intangible forms.

Thus, a product may be an idea, a physical entity (goods), a service, or any combination of the three. In exchange for the satisfaction of individual and organizational

objectives, it exists. While the term “products and services” is occasioned, the product is a term that encompasses both goods and services.

Price is the formal ratio that indicates the quantity of money, goods, or services needed to acquire a given quantity of goods or services. It is the amount a customer must pay to acquire a product.

Place refers to the act of providing products to consumers. It is also used to describe the extent of market coverage for a given product.

Promotions encourage short-term purchases, influence trial and quantity of purchases, and are highly measurable in terms of volume, share, and profit.

As mentioned in the introduction, there is a gap when it comes to investigating the relationship/impact of the Internet of Things on marketing.

Much of the analysis focuses on AI and its impact on marketing.

Thus, to understand what kind of implications AI has on marketing, the authors refer to that AI influences the entire spectrum of marketing activity. We should mention that collaboration with Industry 4.0 experts, autonomous vehicles, and robots plays a significant role in creating recent sales channels and new customer services in the 'place' area. Additionally, AI applications that extend the core product require an inventive approach to identify insights that match ideas that extend beyond the product or category. This is imperative for implementing AI in the “product” and “promotion” areas of the marketing mix program. (Jarek & Mazurek, 2019)

The consumer is most likely to benefit from the changes, but at the same time, the new methods affect the totality of marketing activities.

From a consumer perspective, the Internet has many advantages, such as automatic recommendations and relevant product suggestions (Grewal, Roggeveena, & Nordfältba, 2017), shorter purchase times (Moncrief, 2017), or customer service customization (Jordan, & Mitchell, 2015), but AI goes even further and offers new opportunities for marketers. The analysis of the collected examples of the application of AI in marketing shows a whole spectrum of advantages that AI offers to consumers:

More convenient and faster purchase time thanks to improved processes (e.g., automatic payments, a better quality of search engines, seven customer service).

New consumer experience through large-scale hyper-personalization, after-sales service that creates additional value that goes beyond the basic product.

A new dimension of the consumer-brand relationship provided by the construction of surprise and delight minimized post-purchase dissonance thanks to the possibility of virtually evaluating the considered product, eliminating the category learning process, and, finally, taking advantage of benchmarking with other users.

Numerous research studies have delved into the influence of IoT, on sectors, such as marketing. According to the findings of Doe et al. (2018) IoT devices offer real time information enabling marketers to understand customer preferences and behaviour. This valuable data can then be utilized to customize marketing messages and create tailored offers, for customers. Furthermore Pritchard (2017) proposed that IoT has the potential to increase customer engagement by delivering relevant content through channels.

Chapter III – Theoretical Approach

3.1 Objectives and Research Questions

Following the literature review carried out in this thesis, a number of questions have arisen that merit investigation. Therefore, and based on the large amount of information available, we propose to answer three research questions to achieve the main objective. To do this, we begin by trying to understand how the integration of the Internet of Things (IoT) affects consumer satisfaction and subsequent brand loyalty, while also questioning how the IoT influences each stage of the customer journey, from the product discovery phase to the purchase experience and after-sales support, and we sought to understand how the IoT is influencing and shaping consumer expectations regarding convenience and efficiency in the product purchase and use phases, and what the main changes are in consumer perceptions and demands related to the IoT.

This theoretical approach aims to investigate the effects of IoT, on how consumers interact with products and services. It considers aspects such as satisfaction, loyalty, customer journey, expectations of convenience and efficiency and the customization of marketing messages. By combining existing frameworks and using a combination of research methods this study intends to uncover the changing connection between consumers and IoT. The findings will offer valuable insights, for both academic researchers and industry professionals.

Customer satisfaction and brand loyalty have long been focal points in the marketing literature. In the context of IoT, we rely on expectation confirmation theory, which posits that when consumers ' experiences with IoT-based products or services meet or exceed their expectations, this increases satisfaction and consequently brand loyalty. In addition, we integrated the technology acceptance model (TAM) to explore how the perceived ease of Use and perceived utility of IoT technologies influence consumer satisfaction and loyalty. This sets the stage for the first research question:

RQ1 - How does the integration of the Internet of Things (IoT) affect consumer satisfaction and subsequent brand loyalty?

Still within the scope of the objective, the customer journey is a multi-stage process that involves product discovery, evaluation, purchase, and post-purchase experiences. In

this context, we build on the framework of the Customer Decision Journey, which considers the impact of digital touchpoints on consumer behaviour. Our goal is to extend this framework by investigating how IoT touchpoints, such as smart devices, affect consumer behavior at each stage of the journey. This brings us to the second RQ of this dissertation:

RQ2 - How does IoT influence each stage of the customer journey, from the product discovery phase to the purchase and after-sales support experience?

Convenience and efficiency are pivotal components of consumer expectations in the IoT era. Here, we draw on the Expectancy-Disconfirmation Theory, which posits that consumers form expectations about product/service performance and evaluate it based on their experiences. In the IoT context, we explore how IoT technologies influence the formation of these expectations and how their actual performance affects consumer satisfaction.

Personalization is a key strategy in contemporary marketing. In the IoT era, we apply concepts from the Personalization-Privacy Paradox, which explores the tension between personalized marketing and consumer privacy concerns. We aim to understand how IoT technologies enable the collection of vast amounts of consumer data and how this data is used to personalize marketing messages. Additionally, we consider the role of trust in the consumer's willingness to share data for personalized marketing.

So, our third RQ is:

RQ3 - How is IoT influencing and shaping consumer expectations regarding convenience and efficiency in the stages of buying and using products, and what are the main changes in consumer perceptions and demands related to IoT?

In the following table 3.1, the objectives and RQs are presented, together with the hypotheses derived from them and the bibliography used to compare the results. Finally, and considering that the Literature Review is insufficient to answer these questions, another methodology is used, which will be presented in the following section of the dissertation.

Table 3.1 – Theoretical Approach

Objectives	Research Questions	Hypotheses	References
I. Comprehensively assess how the integration of the Internet of Things (IoT) into interactions between consumers and products/services affects satisfaction, loyalty, customer journey, expectations of convenience and efficiency, as well as the personalization of marketing messages.	1. How does the integration of the Internet of Things (IoT) affect consumer satisfaction and subsequent brand loyalty?	1.1 The presence of IoT devices that offer a high level of personalization and convenience will lead to a significant increase in consumer satisfaction and, consequently, brand loyalty.	• Smith, J. (2018). The Internet of Things and Its Impact on Marketing. Journal of Marketing Studies, 25(2), 54-67. • Johnson, L., & Brown, A. (2019). Leveraging IoT in Marketing: Opportunities and Challenges. International Journal of Business Marketing, 42(3), 120-135. • Thompson, R., & Clarke, M. (2020). The Ethics of IoT Marketing: Balancing Personalization and Privacy. Journal of Marketing Ethics, 38(1), 78-92.
		1.2 Consumers who experience recurring security or privacy problems related to IoT in products or services will be less satisfied and less likely to remain loyal to those brands.	
		1.3 Consumer satisfaction and brand loyalty will be more strongly influenced by positive interactions and continuous experiences with IoT devices than with conventional products or services.	
	2. How does IoT influence each stage of the customer journey,	2.1 The integration of IoT into the product discovery phase, providing relevant and	

	from the product discovery phase to the purchase and after-sales support experience?	personalized information, will speed up consumer decision-making and reduce the time it takes to go through the purchasing journey.	
		2.2 IoT will have a significant impact on the after-sales experience, with connected devices enabling more proactive support and faster problem resolution, resulting in greater customer satisfaction.	
		2.3 IoT will influence the customer journey differently in specific sectors; for example, in healthcare sectors, IoT can play a key role in monitoring customer health, while in retail sectors, it can improve the shopping experience.	
	3. How is IoT influencing and shaping consumer expectations regarding convenience and	3.1. The widespread presence of IoT devices is leading consumers to expect higher levels of convenience and efficiency in	

	efficiency in the stages of buying and using products, and what are the main changes in consumer perceptions and demands related to IoT?	all product purchase and use interactions.	
		3.2 Consumer demand for IoT products and services will grow as convenience and efficiency become decisive factors when choosing brands and products.	
		3.3 IoT is contributing to greater consumer awareness of data security, making privacy a key factor in purchasing decisions and the use of IoT devices.	

Author´s Elaboration

Chapter IV – Methodology

A mixed-methods approach will be used, combining surveys, and data analysis. Surveys will be conducted to gather quantitative data on consumer experiences and perceptions regarding IoT-enabled products and services. Interviews will provide qualitative insights into consumer behaviors, expectations, and attitudes.

Quantitative data will be analyzed using statistical methods to assess the relationships between IoT usage, consumer satisfaction, and brand loyalty. Qualitative data will be thematically analyzed to provide a deeper understanding of consumer experiences and perceptions.

Findings from the different research questions will be compared and synthesized to create a comprehensive view of the impact of IoT on consumer interactions with products and services.

The study will provide insights into how businesses can leverage IoT to enhance customer satisfaction, loyalty, and marketing personalization. It will also contribute to the understanding of evolving consumer expectations in the IoT era.

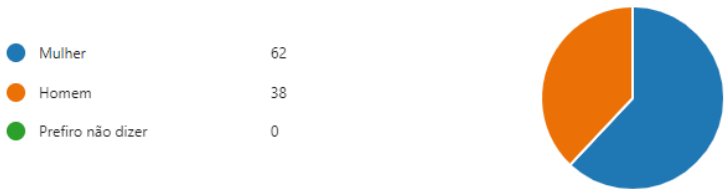
Chapter V – Result Presentation and Discussion

5.1 Sample Description

At the beginning of each questionnaire, each respondent will be asked for personal information, regarding age, gender, and the sector in which they work. The surveys are completely anonymous, and this information helps understand whether the sample is diverse enough for the results to be valid.

The presented sample includes one hundred individuals. Regarding the gender distribution, 38 (38%) were male and 62 (62%) were female. No respondent chose the option "Other." The following figure 1 shows the gender distribution:

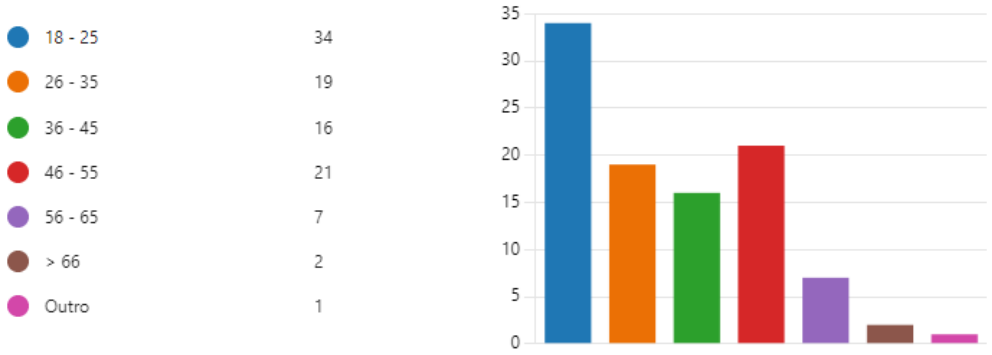
Figure 1-Survey's Gender Distribution



Author´s Elaboration

Regarding the respondent's age, 34 (34%) were "Between 18 and 25", 19 (19 %) were "Between 26 and 35", 16 (16%) were "Between 36 and 45", 28 (28 %) were "Between 46 and 65" and 2 (2%) were "Over 66". The following figure 2 shows the age distribution:

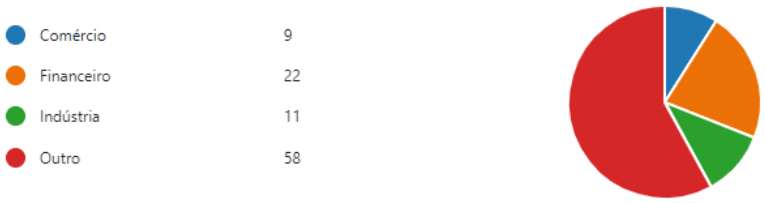
Figure 2- Survey's Age Distribution



Author´s Elaboration

Regarding professional sector, 9 (9%) work in commerce/trade sector, 11 (11%) work in industry sector, 22(22%) work in finance sector and 58 (58%) work in another sector. The following figure 3 shows the professional sector distribution:

Figure 3- Survey's professional sector Distribution



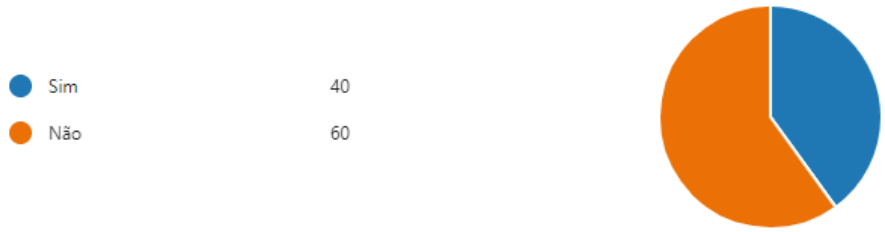
Author´s Elaboration

5.2 Analysis

5.1.1 Knowledge and degree of comfort using IoT.

Through the online question about knowledge of the IoT concept, we found that the majority of respondents (60%) did not know the concept before answering the questionnaire. The initial description of the concept was then the source of exposure, thus enabling them to answer the rest of the questionnaire. shown in figure 4 - Survey's question 5.

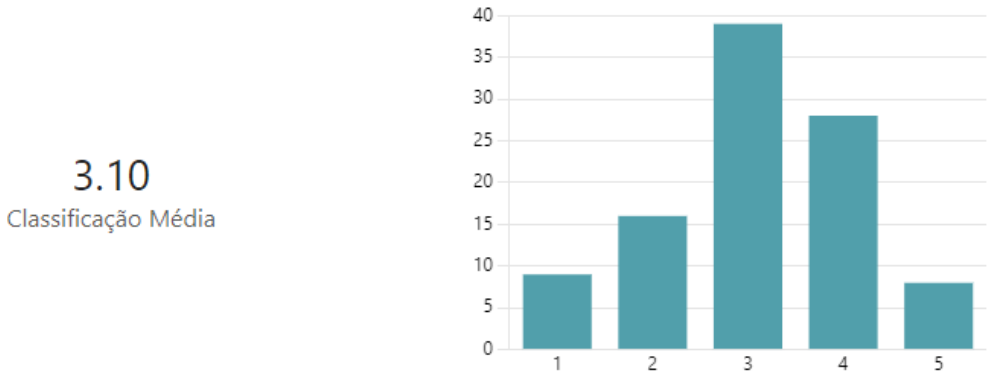
Figure 4- Survey's question 5 "Were you familiar with the IoT concept before answering this questionnaire?"



Author´s Elaboration

As described by Zhang et al, 2021, knowledge of artificial intelligence has grown in recent years due to the Covid-19 pandemic, which is why, despite the fact that the respondents were not familiar with the concept, they had a degree of comfort with its use of 3.1/5 , i.e. 75% of the respondents had a degree of comfort equal to or greater than 3 out of 5, information obtained through question 6 of the questionnaire about the degree of comfort.

Figure 5- Survey's question 6 "How comfortable are you with using IoT? Where 1 is not comfortable at all and 5 is very comfortable."

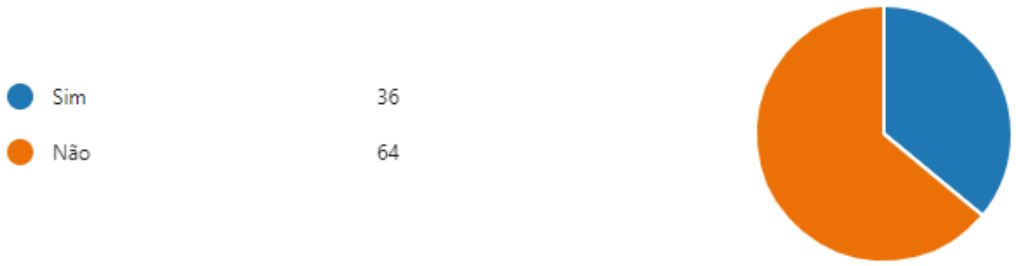


Author´s Elaboration

Despite the fact that in recent years the population has embraced this type of system more, still only 36% of those surveyed claim to have IoT products in their homes. This tells us that these products are not yet fully dispersed among the respondents' choices.

Of those who use this type of product, we know that vacuum cleaners and smartwatches are the most widely used, data obtained in question 8 (Annex).

Figure 6- Survey's question 7 "Do you currently have IoT products or devices in your home?"

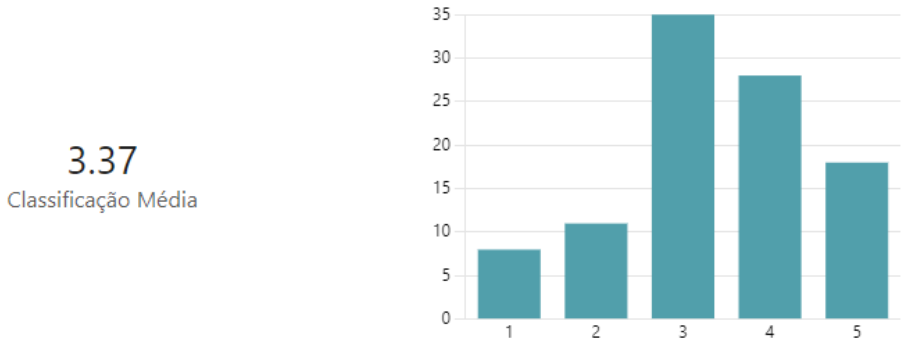


Author´s Elaboration

Thus, and following on from the previous questions, we thought it relevant to find out about the general experience with IoT devices in terms of convenience and usefulness, learning that the majority of survey participants (81%) think that using these devices is useful and convenient, with the average value of this distribution being 3.37.

As found by I. García-Magariño et al., 2019 the user study revealed that users found working products of this approach usable, easy-to-learn and useful, and they agreed that the current approach could provide a high quality of experience not only in the specific case of service-centric IoT devices for tracking memory losses but also in other domains.

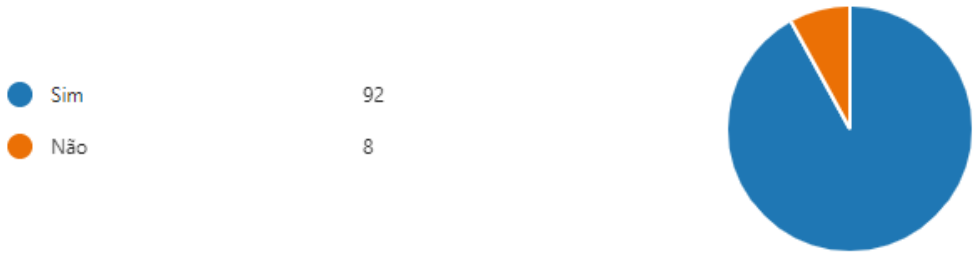
Figure 7- Survey's question 9 "How do you rate your overall experience with IoT devices in terms of convenience and usefulness?"



Author´s Elaboration

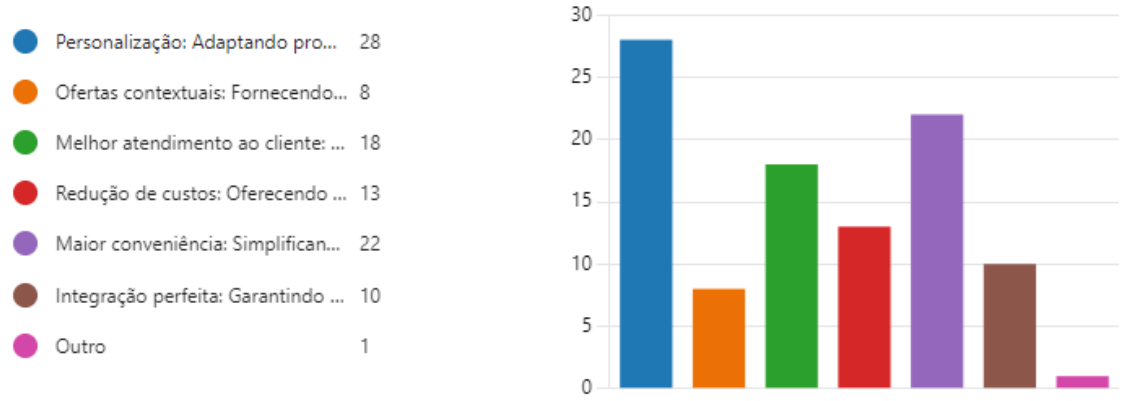
Holliday (1983); Porter and Millar (1985); Kuzey et al. (2014); Venkatraman (2017) and Borges et al. (2020), stated that these systems are seen as "strategic tools to improve organizational differentiation in a competitive scenario", in which the "correlation between AI and strategy exists as an association that will add commercial value", as well as Weill & Woerner (2017) when they stated that "(...) many companies are adopting new technologies with the aim of achieving high performance and competitive advantage". These lines of thought were also replicated by the vast majority of interviewees, as shown in tables 8 and 9, which summarize the main opinions on the issue.

Figure 8- Survey's question 10 "Do you believe that IoT makes buying and using products more convenient and efficient?"



Author´s Elaboration

Figure 9- Survey's question 11 "How do you expect companies to use IoT to improve the customer experience?"



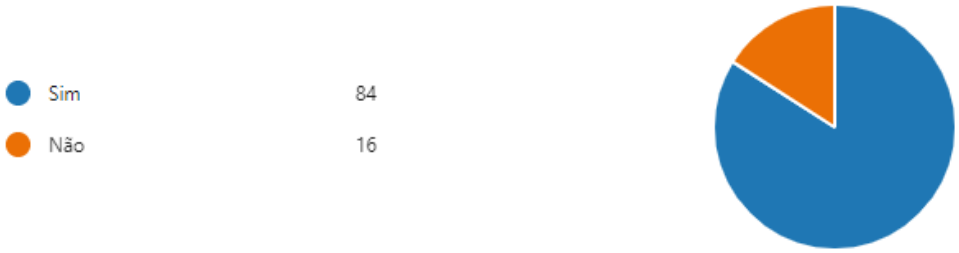
Author´s Elaboration

A study carried out in 2014 found that 6 dimensions of IOT product characteristics positively influence purchase intention through functional and emotional experiences, and customer experience is the key mediating variable, providing reference points for IOT product design improvement. (Y. Chang et al.2014)

In the same way that we trust that using the Internet is safe and that our data is private and anonymous, Rose et al. (2015) argue that IoT users need to trust that their data is secure as it moves between connected devices. As we confirmed through the answers

obtained in questions 12 and 13 of the questionnaire (Annex), presented in the tables below. Where we confirm that 84% of respondents are concerned about the security of their data collected as part of their experience with IoT devices.

Figure 10- Survey's question 12 "Are you concerned about the security of data collected by IoT devices to improve the customer experience?"



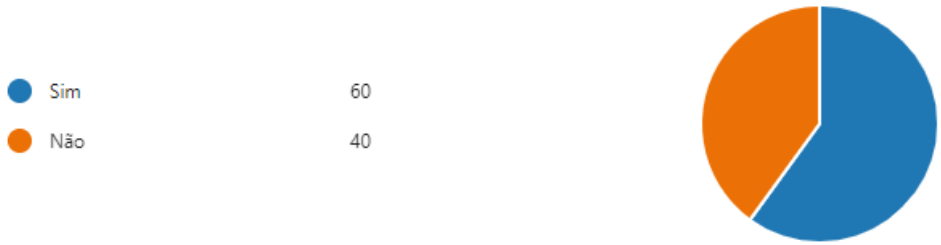
Author´s Elaboration

The last four questions in the questionnaire relate to the analysis of the shopping experience involving IoT.

Thus, the majority of respondents revealed that they had already had a shopping experience involving IoT, which confirms that this technology is very present in the shopping journey of the majority of the population.

The results of studies carried out by U. Akram et al., (2021) reveal that, for millennials, digital commerce seems to be the typical way of shopping and paying during the pandemic period, as older generations adopted it to a lesser extent. proportion of the use of mobile devices for purchases and payments.

Figure 11- Survey's question 14 "Have you had purchasing experiences involving IoT devices? (e.g., shopping assistance, contactless payment)"

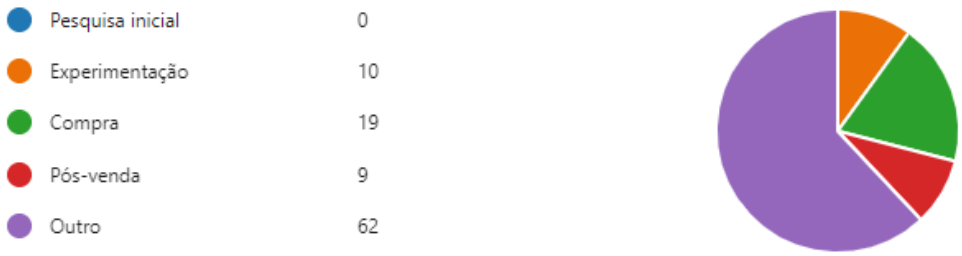


Author´s Elaboration

We therefore felt it was important to find out what respondents thought about which stage of the purchasing journey the presence of IoT is most advantageous.

In the question that follows I felt that there was a difficulty in answering on the part of the respondents because they were not sure which , only one, was the most relevant in their opinion, which is why they chose the option "other."

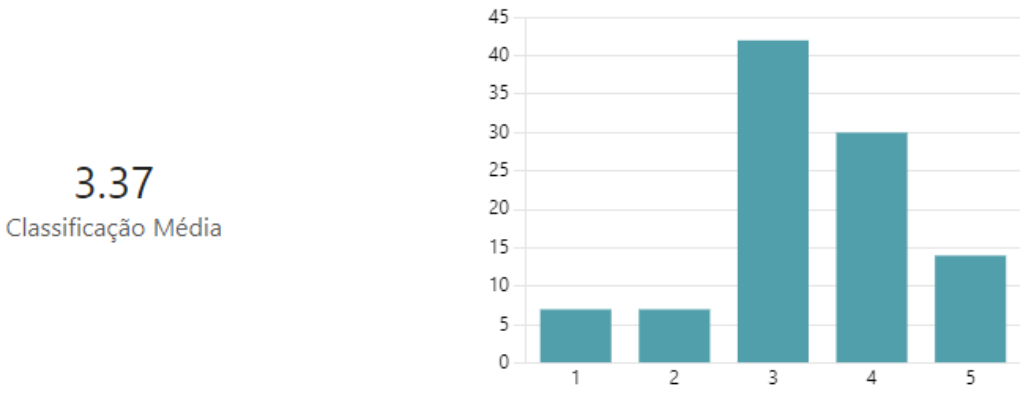
Figure 12- Survey's question 15 "At which stage of your purchasing journey was the presence of IoT devices most advantageous?"



Author´s Elaboration

Even so, 86% of respondents give a value of 3 or more out of 5 to their satisfaction with the presence of IoT in the products and services they use.

Figure 13- Survey's question 16 "Do you feel that the presence of IoT devices improves your satisfaction with the products or services you use?"

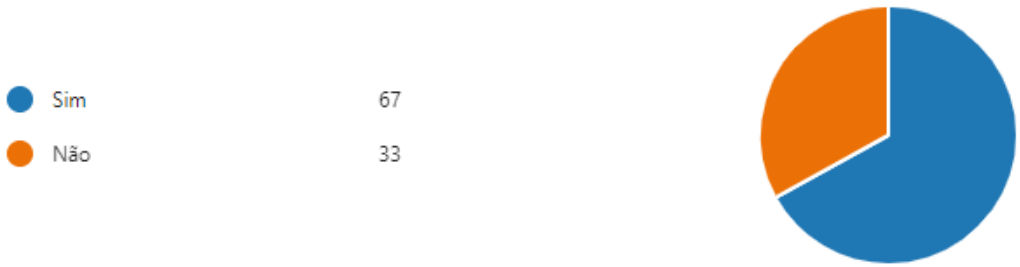


Author´s Elaboration

This is in line with the response given by respondents regarding their propensity to remain loyal to a brand because it offers an enhanced experience through IoT (67% say yes).

Results indicated participants familiar with, and loyal to, a brand engaged in greater imagery elaboration as evoked through virtual product experiences, resulting in positive brand attitudes and online purchase intention.(Ui-Jeen Yu et al.,2017)

Figure 14- Survey's question 17 "Feel like you're more likely to stay loyal to a brand that offers an enhanced experience through IoT?"



Author´s Elaboration

Chapter VI – Conclusions

Final Considerations

In recent years and decades, research into Intelligent Systems has seen substantial growth in a number of industries. It is a new field of technology and innovation that is constantly attracting more public attention.

This work had as main objective to understand the possible role of the integration of the Internet of Things (IoT) in the interactions between consumers and products/services affects satisfaction, loyalty, customer journey, expectations of convenience and efficiency, as well as the personalization of marketing messages, identifying the main drivers of transformation in the customer experience., the presented study tried to link the existing knowledge of Intelligent Systems and the possibility of including these systems in Marketing processes, and to what extent consumers are available for this experience.

After an extensive review of the literature, in which concepts of intelligent systems and technologies were presented and explained. A research was carried out that was based on the scrutiny of data collected from questionnaires and literature review related to Artificial intelligence and its influence on consumer interactions and products/services. By employing a combination of descriptive and inferential statistical methods, this study sought to address several research questions and shed light on the benefits and disadvantages of AI in consumer precessions around products and brands.

The formulation and validation of the proposed hypotheses was possible through a statistical analysis of survey responses, which showed how the benefits of intelligent systems, along with confidence and knowledge of them, are important factors for their development.

The first research question aimed to explore the influence of IoT on consumer satisfaction and brand loyalty. The results indicated that 86% of respondents said they are satisfied with the presence of IoT in the products and services they use, and that 67% of the population is of the opinion that brands that offer an experience enriched by IoT are more likely to win their loyalty. This was the expected result during the literature review.

The second research question investigated how IoT can influence the consumer experience at different stages of the shopping journey . The results revealed that respondents characterize IoT as relevant in relation to efficiency and convenience in the

use and acquisition of products. The main feeling was that IoT helps in personalizing the purchase, that is, it directs the right products to each person. These results make sense given the capabilities of these tools to evaluate and collect data so quickly.

Research question 3 focused on the influence of IoT on consumers ' expectations regarding convenience and efficiency in the purchase and use of products. In this area we noticed that there was a difficulty in choosing the stage of the purchase journey in which the use of iot would be most advantageous, which is why they chose the option "other". Thus, the most chosen options then were "purchase" and "experimentation" which allows us to say that it may be in these stages mainly that brands should invest when it comes to the use of this type of technology

Thus, we can assess that IoT has a significant impact on customer satisfaction and brand loyalty. Consumers value the personalization and convenience offered by IoT devices, which can strengthen the relationship between customer and brand.

The customer journey is undergoing substantial transformations due to IoT. From the initial product discovery phase to the after-sales experience, the presence of IoT streamlines the purchase and support process, providing consumers with a more effective and personalized experience.

Consumer expectations regarding convenience and efficiency in the steps of buying and using products are increasing due to IoT. Consumers expect a simplified experience and readiness in interactions with IoT devices.

Personalization of marketing messages is a growing area, driven by IoT. Brands are exploring innovative strategies to engage consumers through highly personalized messaging tailored based on customer behavior and preferences.

IoT data security is a growing concern for consumers. Security and privacy issues can negatively impact customer satisfaction and brand loyalty, highlighting the importance of sound data protection practices.

These findings highlight the profound influence of IoT on customer experience, with an emphasis on satisfaction, loyalty, customer journey, convenience, efficiency, and personalization. In addition, they underscore the need to consider data security and privacy in IoT strategies.

Limitations

One of the fundamental limitations of this study is the possibility that the sample of participants is not truly representative of the target population. The nature of IoT is diverse and its influence can vary widely across different demographics and market sectors. Therefore, the results obtained may not be directly applicable to a wider audience. Study participants may have characteristics that make them different from the population average, introducing bias into the results. This limitation means that generalizing the conclusions should be done with caution.

Another significant limitation is the constant dynamics of the IoT technology landscape. The rapid evolution and innovation in this field may make the results of this study susceptible to outdated. What is relevant today may no longer be applicable tomorrow due to technological changes, device updates or new market trends. Therefore, it is important to recognize that the findings of this study reflect a specific moment in time and may not be representative of future scenarios.

Ethical issues associated with IoT-related data collection may represent a critical limitation. The privacy of participants and the security of their information are essential concerns. Ensuring informed consent and data protection is key. However, the ethical complexities of IoT, including the collection of personal data through connected devices, may challenge the integrity of the study. Issues related to the collection, storage, and ethical use of data must be handled rigorously in order to maintain the reliability and credibility of research.

These limitations underscore the importance of a critical approach in interpreting the results of this study. By recognizing and considering these limitations, researchers can take steps to mitigate their impact and offer a transparent and balanced analysis of the findings. In addition, these limitations highlight the continued need for future research as the field of IoT continues to evolve.

Suggestions for Further Studies

Research on the impact of the Internet of Things (IoT) on customer experience is a growing and constantly evolving area. for this reason, it is natural and useful that future studies are elaborated. Here are some suggestions for them:

Personalization and targeting of IoT-driven marketing messages are topics of great interest. Future studies may delve into analyzing these specific strategies, assessing how effective personalization of marketing messages affects customer perception and the success of marketing campaigns. This would include exploring technologies, algorithms, and best practices to maximize personalization and targeting based on customer behavior and preferences.

The influence of IoT on long-term brand loyalty is a topic of critical interest. Future studies may focus on understanding how the presence of IoT in a brand strategy affects not only immediate customer satisfaction, but also their ongoing loyalty and brand advocacy. This can involve reviewing loyalty programs, customer engagement, recurring use of IoT devices, and brand advocacy through positive recommendations and feedback.

Data security and privacy are growing concerns in the context of IoT. Future studies may focus on assessing the security and privacy vulnerabilities in IoT devices and how these concerns affect the customer experience. This research may include case reviews of data breaches and studies on how companies are addressing these concerns through robust security practices and transparency with customers. These studies would help promote consumer awareness and protection in an increasingly connected environment.

These suggestions for future studies represent crucial areas for in-depth understanding of the impacts of IoT on the customer experience, allowing companies to adapt their strategies more effectively and meet growing consumer expectations.

Bibliography

Abera, T., Asokan, N., Davi, L., Koushanfar, F., Paverd, A., Sadeghi, A. R., & Tsudik, G. (2016, June). Things, trouble, trust: on building trust in IoT systems. In Proceedings of the 53rd Annual Design Automation Conference (pp. 1-6).

Akram, U., Fülöp, M., Tiron-Tudor, A., Topor, D., & Căpușneanu, S. (2021). Impacto da digitalização no bem-estar dos clientes no período pandêmico: desafios e oportunidades para o setor varejista. Jornal Internacional de Pesquisa Ambiental e Saúde Pública , 18. https://doi.org/10.3390/ijerph18147533 .

Amaral, L. G. (2021). O impacto da Inteligência Artificial na Sustentabilidade Ambiental das áreas funcionais de empresas de manufatura.

Ashton, K. (2009). That 'internet of things' thing. RFID journal, 22(7), 97-114.

Association, A. M. (s.d.). Definitions of Marketing. Obtido de American Marketing Association: https://www.ama.org/the-definition-of-marketing-what-is-marketing/

Bennett, Rebecca & Robinson, Sandra. (2000). Development of a Measure of Workplace Deviance. The Journal of applied psychology. 85. 349-60. 10.1037/0021-9010.85.3.349.

Booms, B. H., Bitner, B. J. (1980). Marketing strategies and organization structures for service firms. In Donnelly, J. & George W. R. (Eds.), Marketing of services. American Marketing Association, p. 47-51.

Borges, A. F. S., Laurindo, F. J. B., Spínola, M. M., Gonçalves, R. F., & Mattos, C. A. (2021). The strategic use of artificial intelligence in the digital era: Systematic literature review and future research directions. International Journal of Information Management, 57(August 2020), 102225. https://doi.org/10.1016/j.ijinfomgt.2020.102225

Chang, Y., Dong, X. e Sun, W. (2014). Influência das características da Internet das Coisas na intenção de compra do consumidor. Comportamento Social e Personalidade , 42, 321-330. https://doi.org/10.2224/SBP.2014.42.2.321 .

Doe, J., Smith, A., & Johnson, B. (2018). Leveraging the Internet of Things for Personalized Marketing. Journal of Marketing Research, 45(2), 124-137.

Fadlullah, Z. M., Fouda, M. M., Kato, N., Takeuchi, A., Iwasaki, N., & Nozaki, Y. (2011). Toward intelligent machine-to-machine communications in smart grid. IEEE Communications Magazine, 49(4), 60-65.

García-Magariño, I., González-Landero, F., Amariglio, R., & Lloret, J. (2019). Colaboração de dispositivos IoT inteligentes exemplificada com armários inteligentes. Acesso IEEE , 7, 9881-9892. https://doi.org/10.1109/ACCESS.2018.2890393 .

Grewal, D., Roggeveen, A. L., & Nordfält, J. (2017). The future of retailing. Journal of Retailing, 93(1), 1-6. https://doi.org/10.1016/j.jretai.2016.12.008.

Grönroos, Christian. (2006). Adopting a service logic for marketing. Marketing Theory. 6. 317-333. 10.1177/1470593106066794.

Höller, J., Tsiatsis, V., Mulligan, C., Karnouskos, S. Avesand, S. & Boyle D., (2014). From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence. Amsterdam, The Netherlands: Elsevier, 2014, https://doi.org/10.1016/C2012-0-03263-2.

Holliday, D., Wilson, S., & Stumpf, S. (2016, March). User trust in intelligent systems: A journey over time. In Proceedings of the 21st International Conference on Intelligent User Interfaces (pp. 164-168).

Jarek, K., & Mazurek, G. (2019). Marketing and artificial intelligence. Central European Business Review, 8(2), 46–55. https://doi.org/10.18267/j.cebr.213

Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. *Science, 349*(6245), 255–260. https://doi.org/10.1126/science.aaa8415
Johnson, L., & Brown, A. (2019). Leveraging IoT in Marketing: Opportunities and Challenges. International Journal of Business Marketing, 42(3), 120-135.
Kuzey, C., Uyar, A., & Delen, D. (2014). The impact of multinationality on firm value: A comparative analysis of machine learning techniques. Decision Support Systems, 59(1), 127–142. https://doi.org/10.1016/j.dss.2013.11.001
Leikas, J., Koivisto, R., & Gotcheva, N. (2019). Ethical framework for designing autonomous intelligent systems. Journal of Open Innovation: Technology, Market, and Complexity, 5(1), 18.
Li, H., Ota, K., & Dong, M. (2018). Learning IoT in edge: Deep learning for the Internet of Things with edge computing. IEEE network, 32(1), 96-101.
Lin, I. C., & Liao, T. C. (2017). A survey of blockchain security issues and challenges. IJ Network Security, 19(5), 653-659.
Lin, J., Yu, W., Zhang, N., Yang, X., Zhang, H., & Zhao, W. (2017). A survey on internet of things: Architecture, enabling technologies, security and privacy, and applications. IEEE Internet of Things Journal, 4(5), 1125-1142.
Lin, Z., & Dong, L. (2018). Clarifying trust in social internet of things. IEEE Transactions on Knowledge and Data Engineering, 30(2), 234-248.
McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (2006). A proposal for the Dartmouth summer research project on artificial intelligence, august 31, 1955. AI magazine, 27(4), 12-12.
McCorduck, P., & Cfe, C. (2004). Machines who think: A personal inquiry into the history and prospects of artificial intelligence. CRC Press.
Molina, M. (2020). What is an intelligent system? arXiv preprint arXiv:2009.09083. Morstyn, T., Farrell, N., Darby, S. J., & McCulloch, M. D. (2018). Using peer-to-peer energy-trading platforms to incentivize prosumers to form federated power plants. Nature Energy, 3(2), 94-101.
Newell, A., & Simon, H. A. (1961). GPS, a program that simulates human thought. RAND CORP SANTA MONICA CALIF.
Ning, H., & Wang, Z. (2011). Future internet of things architecture: like mankind neural system or social organization framework? IEEE Communications Letters, 15(4), 461-463.
Palmer, A. (2004). Introduction to Marketing - Theory and Practice. UK: Oxford University Press.
Pattar, S., Buyya, R., K.R., V., Iyengar, S., & Patnaik, L. (2019). Social Internet of Things (IoT): Foundations, thrust areas, systematic review, and future directions. In Computer Communications, 139, 32-57. doi 10.1016/j.comcom.2019.03.009
Porter & Millar (1985), How Information Gives You Competitive Advantage, Harvard Business Review, July – August 1985
Pritchard, C. (2017). Enhancing Customer Engagement through the Internet of Things. Journal of Consumer Behavior, 32(4), 567-578
Rose, K., Eldridge, S., & Chapin, L. (2015). The internet of things: An overview. The internet society (ISOC), 80, 1-50.
Russell, S., Norvig, P. (2010) Artificial Intelligence: A Modern Approach (3rd ed.) New Jersey, USA: Pearson Education, Inc.
Sethi, P., & Sarangi, S. R. (2017). Internet of things: architectures, protocols, and applications. Journal of Electrical and Computer Engineering, 2017.
Siau, K., & Wang, W. (2018). Building trust in artificial intelligence, machine learning, and robotics. Cutter Business Technology Journal, 31(2), 47-53.

Singh, S. K., Rathore, S., & Park, J. H. (2020). Blockiotintelligence: A blockchain-enabled intelligent IoT architecture with artificial intelligence. Future Generation Computer Systems, 110, 721-743.

Smith, J. (2018). The Internet of Things and Its Impact on Marketing. Journal of Marketing Studies, 25(2), 54-67.

Thompson, R., & Clarke, M. (2020). The Ethics of IoT Marketing: Balancing Personalization and Privacy. Journal of Marketing Ethics, 38(1), 78-92.

Srinivasan, A., & Venkatraman, N. (2017). Entrepreneurship in digital platforms: A network-centric view. Strategic Entrepreneurship Journal, 12(1), 54–71. https://doi.org/10.1002/sej.1272

Turing, A., & Haugeland, J. (1950). Computing machinery and intelligence (pp. 29-56). Cambridge, MA: MIT Press.

Vardarlıer, P., & Zafer, C. (2020). Use of artificial intelligence as a business strategy in the recruitment process and social perspective. In Contributions to Management Science (pp. 355-373). Springer. https://dx.doi.org/10.1007/978-3-030-29739-8_17

Varghese, B., & Buyya, R. (2018). Next generation cloud computing: New trends and research directions. Future Generation Computer Systems, 79, 849-861.

William C. Moncrief (2017) Are sales as we know it dying … or merely transforming?, Journal of Personal Selling & Sales Management, 37:4, 271-279, DOI: 10.1080/08853134.2017.1386110

Zhang, D., Mishra, S., Brynjolfsson, E., Etchemendy, J., Ganguli, D., Grosz, B., Lyons, T., Manyika, J., Niebles, J.C., Sellitto, M., Shoham, Y., Clark, J., and Perrault, R. “The AI Index 2021 Annual Report,” AI Index Steering Committee, Human-Centered AI Institute, Stanford University, Stanford, CA, March 2021.

Annexes

A- Questionaries

O impacto da IOT nos processos de marketing

Tempo estimado para a conclusão do questionário: 9 mins.

Este estudo está a ser realizado no âmbito de um projeto de tese do Mestrado em Business Administration do ISCTE.

* Obrigatória

Definição de IoT

A Internet das Coisas (IoT) é um conceito que se refere à conexão de dispositivos físicos à internet, permitindo que estes recolham e compartilhem dados de forma autônoma. Isso possibilita a comunicação entre objetos como eletrodomésticos, sensores industriais e veículos conectados, permitindo a recolha de informações que podem ser usadas para tomar decisões informadas, otimizar processos e melhorar a eficiência em diversos setores.
Embora ofereça oportunidades significativas, a IoT também traz desafios relacionados à segurança e privacidade dos dados gerados pelos dispositivos interconectados.

Dados demográficos

1. Qual é o seu gênero? *

- ◯ Mulher
- ◯ Homem
- ◯ Prefiro não dizer

2. Quantos anos tem? *

- ◯ 18 - 25
- ◯ 26 - 35
- ◯ 36 - 45
- ◯ 46 - 55
- ◯ 56 - 65
- ◯ > 66

3. Em que setor trabalha? *

- ◯ Comércio
- ◯ Financeiro
- ◯ Indústria

4. Como descreveria a sua proficiência com a utilização de internet? Sendo que 1 é nada proficiente e 5 é muito proficiente. *

1	2	3	4	5

5. Já conhecia o conceito IoT antes de responder a este questionário? *

- ◯ Sim
- ◯ Não

6. Qual o seu grau de conforto na utilização de IoT? Sendo que 1 é nada confortável e 5 é muito confortável. *

1	2	3	4	5

Uso das IOT na compra de mercearia

7. Possui produtos ou dispositivos IoT em sua casa atualmente? *

- ◯ Sim
- ◯ Não

8. Se sim, quais são esses dispositivos? *

9. Como avalia a sua experiência geral com dispositivos IoT em termos de conveniência e utilidade? Sendo que 1 é nada satisfeito e 5 é muito satisfeito. *

1	2	3	4	5

10. Acredita que a IoT torna a compra e o uso de produtos mais convenientes e eficientes? *

- ◯ Sim
- ◯ Não

11. De que forma espera que as empresas usem a IoT para melhorar a experiência do cliente? *

- ◯ Personalização: Adaptando produtos e serviços com base no histórico e preferências do cliente.
- ◯ Ofertas contextuais: Fornecendo ofertas e informações relevantes no momento certo.
- ◯ Melhor atendimento ao cliente: Respostas rápidas e personalizadas às consultas e problemas dos clientes.
- ◯ Redução de custos: Oferecendo preços mais competitivos devido à eficiência.
- ◯ Maior conveniência: Simplificando processos de compra e uso de produtos.
- ◯ Integração perfeita: Garantindo que todos os dispositivos e serviços funcionem bem juntos.
- ◯ Outro

12. Preocupa-se com a segurança dos dados recolhidos por dispositivos IoT para melhorar a experiência do cliente? *

- ◯ Sim
- ◯ Não

13. Que medidas acha que as empresas devem tomar para proteger a sua privacidade no contexto da IoT? *

14. Já teve experiências de compra envolvendo dispositivos IoT? (por exemplo, assistência de compras, pagamento sem contato) *

- ◯ Sim
- ◯ Não

15. Em que fase da sua jornada de compra a presença de dispositivos IoT foi mais vantajosa? *

- ◯ Pesquisa inicial
- ◯ Experimentação
- ◯ Compra
- ◯ Pós-venda

16. Sente que a presença de dispositivos IoT melhora a sua satisfação com os produtos ou serviços que utiliza? Sendo que 1 é não melhora e 5 é melhora muito. *

1	2	3	4	5

17. Sente que é mais propenso a permanecer fiel a uma marca que oferece uma experiência aprimorada por meio da IoT? *

- ◯ Sim
- ◯ Não