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Customer satisfaction in service delivery with artificial intelligence: A meta-analytic study

Satisfação do cliente na prestação de serviços com inteligência artificial: Um estudo meta-analítico

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ABSTRACT

Purpose: This study intends to identify the main background and consequent constructs that form consumer satisfaction in providing services using artificial intelligence (AI) and their magnitudes.

Originality/value: This work seeks to fill a gap arising from the scarcity of meta-analytic research on service delivery with AI and also its relationship to consumer satisfaction.

Design/methodology/approach: The study adopted the meta-analytic method, and its development followed three phases: 1. research; 2. collection; and 3. coding and data analysis. We analyzed 19 articles published in journals of international relevance from January 2000 to December 2020, present on the Web of Science and Science Direct platforms, totaling 128 observations and 28 topic-related.

Findings: Five background constructs and one consequent construct were identified, from which an integrated model was built to illustrate the relationships between consumer satisfaction in intelligent services. The results show that consumer satisfaction in the provision of services is significantly correlated to the adoption of artificial intelligence. Then, the integrated quantitative evaluation that was performed in this study aims to contribute to future empirical evidence in such a way that an increase in the scope of studies on artificial intelligence and consumer satisfaction occurs, based on the analysis of the following constructs: perceived value, perceived features, perception of quality, marketing orientation, identification with the service and behavior of using AI in services.

Keywords: artificial intelligence, services, consumer satisfaction, meta-analysis, integrated model

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RESUMO

Objetivo: O presente estudo tem como objetivo identificar os principais construtos antecedentes e consequentes que compõem a satisfação do consumidor na prestação de serviços que utilizam inteligência artificial (IA) e suas magnitudes.

Originalidade/valor: Este estudo busca preencher uma lacuna advinda da escassez de pesquisas meta-analíticas sobre a prestação de serviços com IA e sua relação com a satisfação do consumidor.

Design/metodologia/abordagem: O presente trabalho adotou o método meta-analítico e o seu desenvolvimento seguiu três fases: 1. pesquisa; 2. coleta; e 3. codificação e análise de dados. Foram analisados 19 artigos publicados em periódicos de relevância internacional no período de janeiro de 2000 e dezembro de 2020, presentes nas plataformas Web of Science e Science Direct, que totalizaram 128 observações e 28 relações.

Resultados: Foram identificados cinco construtos antecedentes e um construto consequente. A partir disso, construiu-se um modelo integrado para ilustrar as relações da satisfação do consumidor em serviços inteligentes. Os resultados alcançados demonstram que a satisfação do consumidor na prestação de serviços está significantemente correlacionada a adoção de inteligência artificial. Em suma, a avaliação quantitativa integrada que foi realizada neste estudo, visa contribuir com futuras evidências empíricas de tal maneira que ocorra um aumento do alcance dos estudos em inteligência artificial e satisfação do consumidor, a partir da análise dos seguintes construtos: valor percebido, recursos percebidos, percepção da qualidade, orientação mercadológica, identificação com o serviço e comportamento de uso de AI em serviços.

Palavras-chave: inteligência artificial, serviços, satisfação do consumidor, meta-análise, modelo integrado

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INTRODUCTION

Artificial intelligence (AI) has the power to revolutionize the way businesses interact with their customers (Mclean & Osei-Frimpong, 2019) and radically change the marketplace (Bock et al., 2020). Specifically, AI advances can improve the customer experience by increasing companies' knowledge about their preferences and buying patterns (Evans, 2019). Deploying AI technologies strategically at different key customer contact posts can therefore bring significant benefits to companies and a possible increase in customer satisfaction (Ameen et al., 2021).

In AI, machines rely on big data, processing power, algorithms, and other factors to perform aspects like human cognition (Bulchand-Gidumal, 2020; Syam & Sharma, 2018). In the process of the Fourth Industrial Revolution or Industry 4.0, the disruptive potential of AI in the service sector is high, especially when it is noted that there is a constant uptake of AI in customer service; customers prefer to be served by machines rather than human employees, and the continual use of recommender systems and robots (Li et al., 2019; Bock et al., 2020).

While humans can learn and draw conclusions from a limited amount of data, machines can learn from millions or billions of data points (Ramaswamy, 2017). Thus, with AI focused on automating service encounters, massive data sets can be customized and modified to fit each consumer's consumption context. Van Doorn et al. (2017) state that by 2025 the use of technologies such as AI is expected to improve customer experience across service industries.

In this way, AI will be increasingly present in practical solutions in the various service sectors, such as intelligent controls in-room services, banking automation, interactive tour guide, and chatbots, reducing human costs while increasing the curiosity of customers to know the business (Ivanov et al., 2017). Still, even though there is a growing rise in the managerial uptake of AI in services and the service-dominant logic (SDL) recognizes that the actors involved in the process can include machines and technologies (Lusch et al., 2016), the advancement of understanding the impact of AI on value co-creation is still generic and limited (Kaartemo & Helkkula, 2018).

Considering companies' significant investments to deploy artificial intelligence, proof of how customers cope and whether they trust and are satisfied with this technology is needed (Mithas & Rust, 2016; Brill et al., 2019).

The issue of consumer satisfaction has always been of great interest to marketing professionals and academics (Kumar, 2016; Brill et al., 2019).

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According to Oliver (1981), satisfaction is a construct that relates to the evaluation of perceived discrepancies between a product's expectations and the product's performance after consumption. Rego et al. (2013) corroborate this by stating that consumer satisfaction is a central construct in consumer behavior, strategy, and theoretical and empirical modeling in marketing.

Such relevance is noticed in a recent bibliometric review of 587 articles published from 1998 to 2019 in the *Journal of Service Research* (JSR). The study revealed that the most frequent topic published in over two decades in the prestigious journal was consumer satisfaction, with 66 publications and 3,940 citations. Such performance emphasizes the topic's pressing importance in JSR and indicates its continued prominence in the broader academic domain beyond service boundaries (Donthu et al., 2022).

Considering the scarcity of meta-analysis studies that investigate the terms artificial intelligence, services, and customer satisfaction simultaneously, this research was timely. Therefore, unlike other studies as those of Blut et al. (2021) and Khan et al. (2022) that explored the relationship between AI and services, this research included the construct of customer satisfaction since this inclusion may be an important element in improving the understanding about satisfaction-related aspects of service delivery that use artificial intelligence, as well as enable the indication of new paths that may expand service delivery when using AI technology as a distribution channel.

Based on that, meta-analytic research and content analysis were made to identify the main constructs associated with consumers' perception of AI adoption in service delivery and thus provide generalizable empirical results. Therefore, this research aims to identify the main background and consequent constructs that make up the satisfaction of service delivery using artificial intelligence and its magnitudes. The importance of this study is due to the scarcity of meta-analytic research on the issue, and it presents opportunities to provide greater clarity and insights for further study and companies adopting AI. Furthermore, when searching for research that relates to the three themes addressed in this article, the Scopus database contains 62 articles related to the area of administration published in the last 20 years, with a growing interest in the previous four years.

Hence, this research intends to contribute to a better understanding of consumer satisfaction in services that use artificial intelligence, with the classification of constructs that form the relationships with consumer satisfaction, the calculations of effect sizes of these relationships, and, finally, to bring an integrated model that can be used for future measurements in studies that seek to understand the background and consequent factors of

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the consumer satisfaction in services that use elements of artificial intelligence in their processes.

LITERATURE REVIEW

Artificial intelligence and value creation

By raising a question about machines' ability to think, Alan Turing began comparing analogies between machines and humans in the 1950s (Turing, 1950). Then, AI can be defined as a set of technologies that can mimic human intelligence in a problem-solving decision-making process (Lai & Hung, 2018). It is emphasized that AI combines advanced software and hardware resources so that, with the help of the information they have, they can act rationally to achieve the best outcome or, in case of uncertainty, the best-expected outcome (Shukla & Vijay., 2013; Paschen et al., 2020).

Definitions of AI in marketing, following the tradition of other literature, generally describe AI in terms of human intelligence. However, basing the definition of AI on human capabilities is limiting (Bock et al., 2020). One description that helped delineate the domain of AI and allowed for proper measurement of the construct was that offered by Kaplan and Haenlein (2019, p. 17), who define AI as the "ability of a system to interpret external data correctly, to learn from that data, and to use those learnings to achieve specific goals and tasks through flexible adaptation."

With the aim of a better understanding to occur about the implications of what AI can bring in socioeconomic terms, Neuhofer et al. (2020) suggest a three-dimensional categorization. The first dimension is Weak AI, designed to solve specific problems, recognize faces, drive cars, or provide assistance through chatbots (Russell & Norvig, 2016; Van Doorn et al., 2017). Enhancing the accessible data limit, the second dimension is composed of artificial general intelligence (AGI). At this level of consciousness, AI can generalize knowledge and reflect, making it capable of surpassing human cognition. Finally, in the third dimension would lie artificial superintelligence, which would constitute a scenario in which machines would be unaware of limits and exceed human capabilities at any level (Russell & Norvig, 2016). Nevertheless, AGI and artificial superintelligence are still far from being achieved.

These forms of AI differ in their development stage and market application, and AGI is still considered a technology for the future (Neuhofer et al.,

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2020). Plus, other levels of AI are present in everyday life, and many individuals are not yet fully aware of it. Some examples of bots that offer personalized services are Siri and Alexa, which act as voice assistants on devices (Tussyadiah & Miller, 2019).

Ivanov et al. (2018) claim that the success of service delivery depends not only on the value it creates for the user but also on the value it creates or destroys for the network in which the user is embedded. With increasingly demanding customers, applying and enhancing bots and AI is increasingly necessary, as improving customer service experiences will increasingly involve technology infusion, which these authors define as the incorporation by organizations belonging to the service sector of technological elements into the frontline customer experience.

Then, as AI-based functions become more common in markets and everyday life, they are likely to change how they create value and experiment. Some of the benefits of using bots and AI are: Faster customer service; providing a real-time response, regardless of time; demonstrating empathy (those using deep learning); proactive approach; improving logistics; strengthening the brand in post-sales; learning customer needs and preferences, among others (Kaartemo & Helkkula, 2018). Therefore, AI is increasingly present and influencing the population's daily lives and is also an important technological component of the market, especially in the service sector.

Service and customer satisfaction

The service sector is becoming increasingly crucial for the economy of developing countries, such as Brazil. This importance is due to the need to measure service quality. From this perspective, several researchers have led research in this area, seeking to perfect their conceptualization and develop measurement techniques, as was the case with Lusch and Vargo (2014, 2015; Lusch et al., 2016).

Customer satisfaction has become an important element in assessing organizational performance and is considered the baseline for the performance standard and a possible criterion of excellence for any business. Specifically, customer satisfaction can be evaluated in terms of interest, pleasure; empathy; surprise; trust; anger, readiness; good choice, among others. This construct is crucial for the service sector because customer satisfaction has proven to be the key point in measuring service quality (Omar et al., 2015; Padlee et al., 2019).

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To achieve customer satisfaction, an organization needs to provide services with specific levels of perceived value, for instance, when the value of the service matches the price customers pay for the service (Lu et al., 2015; Padlee et al., 2019). In this way, customer satisfaction indicates the belief in the likelihood that service will lead to a positive feeling. It is considered a key variable for subsequent behaviors, such as loyalty and word-of-mouth advertising.

Sirgy et al. (2007) clarify that in the United States, there is the American Consumer Satisfaction Index (ACSI), which highlights that satisfaction theory is mainly determined by perceived value, perceived quality, and consumer expectations. This measure is considered highly representative of all conceptualizations and standards of customer satisfaction.

Hence, customer satisfaction is a critical factor in generating loyalty and future purchase behavior because customers satisfied with the service provider's service would increase future usage intentions. This is because the perceived quality of the service matches their expectations. Thus, there is evidence of a positive relationship between customer satisfaction and repurchase intention (Pham & Ahammad, 2017; Rita et al., 2019).

Considering that unsatisfied customers look for another service provider, identifying the factors that lead them to purchase the service and their satisfaction is paramount to the success of companies. Yet, customer satisfaction is not always enough. You must delight them to exceed their expectations because satisfaction leads to positive recommendations, which, in turn, brings new customers. However, suppose there is a failure or a misunderstanding (related to procedures, understanding, and engagement) during this path. In that case, the opposite will occur, that is, the escape of customers, negative word-of-mouth, complaints, and various other private or public actions (Boadi et al., 2018; Kuhzady & Ghasemi, 2019; Järvi et al., 2020).

Consequently, given companies' significant investment in AI technology, not to mention the redesign of key production and customer service processes, it becomes necessary to demonstrate that customers actually trust and are satisfied with artificial intelligence (Brill et al., 2019). Because of little empirical evidence of customer satisfaction in artificial intelligence, since AI is considered a new kind of technology, it becomes significant to identify the variables of customer satisfaction in the adoption of artificial intelligence services since this knowledge can maximize business opportunities, present the benchmark, develop a way to generate value, and serve as a guide for future improvements.

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METHODOLOGY

According to Glass (1976, p. 3), in his classic definition, meta-analysis can be defined as follows:

> [...] meta-analysis refers to the analysis of analyses, the statistical analysis of a large group of results from individual studies for the purpose of integrating the results. It is a rigorous alternative to casual, narrative discussion of the literature.

Despite the numerous criticisms received, meta-analysis has grown and spread to other fields, such as social/behavioral sciences and health sciences, adopted and widely used in marketing. Meta-analysis presents itself not only as a method that allows a more rigorous review of the literature but is also capable of

> [...] discovering new knowledge that would not be possible to infer from any of the studies if it were taken individually, and also of proposing and answering questions that were never addressed in any of the individual works included in the meta-analysis (Hunter & Schmidt, 2004, p. 26).

This work adopted the meta-analytic method, and its development followed three phases: 1. search; 2. collection; and 3. coding and data analysis. Firstly, in the data search phase, a search was done in the following electronic databases: Web of Science and Science Direct. Preference was given to articles published in relevant journals in the area.

For data collection, the terms "service," "artificial intelligence," and "satisfaction" were used, present in the titles, abstracts, and keywords of the articles, and the time interval chosen was from January 2000 to December 2020. Furthermore, the document type filters were applied, choosing "articles" and the area filter segmented by "business" in such a way as to find the articles published in journals most relevant to the area of administration. In this search on both platforms mentioned above (Web of Science, Science Direct), 143 articles were found. After removing the qualitative articles, those that did not have consumer satisfaction as a focus, and the non-empirical ones, we obtained 19 valid studies for analysis and related to the objective of this article.

For the coding stage, the following criteria in the studies were observed: study title, author(s), the country where data collection was conducted, sample size, the scale used, number of items in the scale, reliability index,

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variance index, statistics, and correlations reported. Thus, from a content analysis performed with the constructs of the scales observed, 106 independent relationships and 22 response relationships were observed, which were segmented into six constructs of research for this article, they are perceived value, perceived features, perception of quality, marketing orientation, identification with the service and user behavior.

We defined the constructs since they can be understood as concepts that involve more abstract levels of mental representations, intentionally built as ideational constructs that can be decomposed (Kerlinger, 1973). Since, according to Feist et al. (2015), constructs have characteristics and attributes that make them recognizable from a naming, the constructs in this article were named from their components. Some of the descriptions of these constructs and their relationships were adapted from Santini et al. (2017) and are presented below in Table 1.

Table 1

Definitions of the study constructs and indicators

Construct	Definition	
Perceived value	Set of values that impact consumers' perceptions of the use of AI in the services provided	
Components	Definitions	References
Trust	Intentions and behaviors that indicate in the security that the service has added value from the use of AI.	Ameen et al. (2021), Purwanto et al. (2020), Chen et al. (2021), Chiang and Trimi (2020), Payne et al. (2018), Pillai et al. (2020), Zeinalizadeh et al. (2015), Kervenoael et al. (2020).
Control	Perception of control that the consumer has that he can influence the service that relies on an AI.	Purwanto et al. (2020), Kervenoael et al. (2020), Pillai et al. (2020), Söderlund (2020).
Empathy	Perception of care from a service delivery that uses AI.	Chiang and Trimi (2020), Gursoy et al. (2019), Lin et al. (2020), Pillai et al. (2020), Prentice et al. (2020), Qiu et al. (2020), Söderlund (2020), Zhu and Chang (2020), Kervenoael et al. (2020).
Hedonism	Perception of pleasure associated with a service that uses AI.	Gursoy et al. (2019), Lin et al. (2020).
Negative effects	Perception that using AI in service may not generate value.	Ameen et al. (2021), Pillai et al. (2020), Pillai and Sivathanu (2020), Sorderlund and Trivedi (2019).

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Table 1 (continuation)

Definitions of the study constructs and indicators

Construct	Definition	
Perceived value	Set of values that impact consumers' perceptions of the use of AI in the services provided	
Components	Definitions	References
Utility	Perception that there is useful value in services that make use of AI.	Payne et al. (2018), Prentice et al. (2020), Zeinalizadeh et al. (2015), Kervenoael et al. (2020).
Construct	Definition	
Perceived resources	Tangible and intangible resources perceived in customer service from the use of AI	
Components	Definitions	References
Access	Perception of tangibility in a service using AI.	Chiang and Trimi (2020), Zhu and Chang (2020), Kervenoael et al. (2020).
Customization	Perception that it is possible to adapt a service with AI to the consumer's needs.	Ameen et al. (2021), Chen et al. (2021), Pillai et al. (2020), Söderlund (2020).
Usability	Perception that there are facilities in the effort employed to use the service with AI.	Chen et al. (2021), Qiu et al. (2020), Zeinalizadeh et al. (2015).
Performance	Expectation that the service using AI will meet expected performance.	Purwanto et al. (2020), Gursoy et al. (2019), Lin et al. (2019).
Service	Expectation that employees are trained to provide a service that uses AI.	Prentice and Nguyen (2020), Prentice et al. (2020), Söderlund (2020), Zeinalizadeh et al. (2015).
Construct	Definition	
Quality perception	Perceptions of the quality involved in the services provided with the adoption of AI	
Components	Definitions	References
Quality in the use of AI	Evaluation of the quality perceived by the adoption of AI in the execution of the service.	Ameen et al. (2021), Payne et al. (2018), Prentice and Nguyen (2020), Moriuchi et al. (2021), Pillai and Sivathanu (2020).
Quality in service	Perception of quality of the support given in the service.	Payne et al. (2018), Moriuchi et al. (2021), Trivedi (2019).
Quality in the systems	Perception of the quality of service technology systems using AI.	Purwanto et al. (2020), Trivedi (2019), Zeinalizadeh et al. (2015).

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Table 1 (continuation)

Definitions of the study constructs and indicators

Construct	Definition	
Quality perception	Perceptions of the quality involved in the services provided with the adoption of AI	
Components	Definitions	References
Quality in the results	Perception of the quality of the results generated after contact with the service you use AI.	Purwanto et al. (2020), Choi et al. (2020), Moriuchi et al. (2021), Zeinalizadeh et al. (2015).
Construct	Definition	
Marketing orientation	Strategies used by service providers that adopt AI to meet market demands	
Components	Definitions	References
Performance	Use of process improvement-oriented systems.	Ameen et al. (2021), Chen et al. (2021), Gursoy et al. (2019), Lin et al. (2020), Zeinalizadeh et al. (2015).
Competitiveness	Service management with the goal of gaining a competitive advantage.	Payne et al. (2018), Pillai et al. (2020), Kervenoael et al. (2020), Moriuchi et al. (2021).
Financial advantage	Consideration of the financial impact of adopting AI on service execution.	Zeinalizadeh et al. (2015).
Construct	Definition	
Identification with the service	Factors that demonstrate the consumer's identification with the service they use AI	
Components	Definitions	References
Relationship	Perception that the service connects with the consumer from the use of AI.	Qiu et al. (2020), Trivedi (2019).
Emotions	Evaluations of the feelings generated in the service experience with AI.	Gursoy et al. (2019), Lin et al. (2020), Pillai et al. (2020), Prentice and Nguyen (2020), Qiu et al. (2020).
Environment	Perception of the service atmosphere created from the use of AI.	Pillai and Sivathanu (2020), Qiu et al. (2020), Zhu and Chang (2020), Payne et al. (2018).

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Table 1 (conclusion)

Definitions of the study constructs and indicators

Construct	Definition	
Usage behavior	Intentions and behaviors that result from consumers' satisfaction with the use of AI in services	
Components	Definitions	References
Consumer experience	Intentions and behaviors that indicate favorable or unfavorable perceptions in the service user experience.	Ameen et al. (2021), Purwanto et al. (2020), Chen et al. (2021), Chiang and Trimi (2020), Choi et al. (2020), Qiu et al. (2020), Zeinalizadeh et al. (2015), Zhu and Chang (2020).
Intention to use	Behaviors that indicate that there is a propensity for a consumer to use a service that contains AI.	Gursoy et al. (2019), Lin et al. (2020), Pillai et al. (2020), Kervenoael et al. (2020).
Use objection	Behaviors that indicate that there is no propensity for a consumer to use a service that contains AI.	Gursoy et al. (2019), Lin et al. (2020).
Attitude towards AI	Perceptions of a consumer's action when experiencing a service encounter that used AI.	Payne et al. (2018).
Loyalty	A consumer's intention to maintain long-term contact with a service company using AI.	Moriuchi et al. (2021), Prentice and Nguyen (2020), Prentice et al. (2020), Trivedi (2019).
Purchase intention	Perception of the influence of AI on the propensity of a consumer to contract a service.	Moriuchi et al. (2021), Pillai et al. (2020).

Source: Elaborated by the authors.

In the data analysis phase, Pearson's bivariate correlation r was used to measure the effect sizes between the satisfaction and the relationships observed in the studies. This measure is widely used in studies in a meta-analysis (Vieira, 2020; Santini et al., 2018; Santini et al., 2017; Brei et al., 2011). The regression coefficient was used for their conversion in studies where correlation coefficients were not reported (Peterson & Brown, 2005). Hunter and Schmidt (2004) suggested that random effects models were used. To measure the correlation level of Pearson's r, the parameters of Cohen (1988).

It is suggested that effect sizes be adjusted into Fisher's Z coefficients before weighting them by sample size (Kirca et al., 2005). This is because

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Pearson's r does not have a normal distribution and needs to be corrected. Also, because the sample of studies used in this article has a considerable number of t-test analyses of variance (Lipsey & Wilson, 2001), Cohen's d was used as another measure of effect size. To measure the effect size of Cohen's d, Cohen's (1988) parameters were used. Then, for each correlation adjusted for sample size, the standard error was calculated, and the 95% confidence interval was considered.

To estimate the probable values of the population parameter, confidence intervals (Wooldridge, 2011) were measured, with the upper confidence interval indicated by ICupper and the lower confidence interval shown by IClower. Therefore, the test for homogeneity (Q) was performed from the significance calculated by chi-square (X^2) with N-1 degrees of freedom (Vieira, 2020).

Therefore, once adjusted for an $\alpha = 0.05$, the fail-safe number (FSN) was measured, representing the number of studies with a non-significant correlation required to reduce the effect produced by the Relationships in this study to a non-significant level. The use and measurement of an FSN reflect the robustness of the results of a meta-analysis study and indicates that the higher the number, the greater the confidence that the investigated relationship is not null (Rosenthal, 1979, 1991). Finally, the data were analyzed in SPSS 22, as indicated by Brei et al. (2014).

RESULTS

Studies published on the Web of Science and Science Direct platforms from January 2000 to December 2020 were examined. The samples of studies chosen for this article total 8,316 respondents and belong to about ten different countries.

The perceived value of AI adoption in services and consumer satisfaction

Table 2 displays the results found in the relationships between perceived value in the adoption of AI in services and satisfaction. In total, seven components were associated with consumers' perception of the value delivered by the adoption of AI in service delivery: trust, control, empathy, hedonism, negative effects, interaction, and utility.

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Table 2

Perceived value

Components	k	o	N	ES	d of Cohen	ICIower	ICupper	Q	FSN
Trust	9	10	3705	0.63	2.06	0.60	0.66	356.33	114
Control	6	8	3661	0.75	2.16	0.71	0.78	961.33	89
Empathy	9	9	4440	0.93	2.30	0.90	0.96	1683.99	167
Hedonism	3	3	2294	0.52	2.25	0.47	0.56	1466.94	31
Negative effects	5	6	3760	0.80	2.19	0.76	0.83	1144.62	80
Interaction	7	7	3752	0.86	2.27	0.82	0.89	1559.16	120
Utility	4	6	1558	0.34	2.23	0.29	0.39	1364.03	27

Source: Elaborated by the authors.

Note: k = number of studies used in the analysis; o = number of observations extracted from the studies analyzed; N = number of cumulative samples from the studies analyzed; ES = corrected effect size; FSN = *fail-safe number*.

In this construct, all correlations were considered significant ($p < 0.001$) and homogeneous ($p < 0.001$). It is also observed that the index measured by Cohen's d is very high in all relations, indicating a strong connection in the effect sizes. Furthermore, the relationship between utility and satisfaction can be considered average ($r = 0.34$), and the relationship between empathy and satisfaction was considered the strongest ($r = 0.63$), followed by the relationship between interaction and satisfaction ($r = 0.86$). The other connections between the analyzed components and consumer satisfaction can also be considered strong since they are in the range between 0.52 and 0.8 (Cohen, 1988).

Trust, empathy, and interaction components showed the highest NPF indices, 114, 167, and 120, respectively. This implies that, according to the parameter of Rosenthal (1991), it takes more than a hundred studies with non-significant results to invalidate the relationship between these components and consumer satisfaction.

Perceived service delivery features and consumer satisfaction

Table 3 presents the results obtained for the relationships between perceived resources in service delivery using AI and consumer satisfaction. After content analysis, five components were considered corresponding to measuring the relationships considered in this construct. They are access, customization, usability, performance, and service.

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Table 3

Perceived resources

Components	k	o	N	ES	d of Cohen	IClower	Icupper	Q	FSN
Access	3	4	865	0.16	2.10	0.09	0.23	64.23	10
Customization	4	4	2401	0.57	2.41	0.53	0.62	541.73	46
Usability	3	3	995	0.23	2.32	0.17	0.29	189.15	14
Performance	3	3	1194	0.29	2.44	0.23	0.35	282.02	17
Service	4	4	1615	0.36	2.27	0.31	0.41	264.90	29

Source: Elaborated by the authors.

It is observed that the relationships can be considered significant ($p < 0.001$) and homogeneous ($p < 0.001$), and the effect size calculated by Cohen's d was very high in all components. The relationships between access, usability, and performance with consumer satisfaction proved small ($0.1 < r < 0.29$). In contrast, the other relationships can be considered median ($r = 0.36$) and high ($r = 0.57$) from the corrected r coefficient in the experimental studies.

The highest fail-safe number in this construct was the customization component (46), and the lowest was the access component (10). It is possible to state that a high number of studies with non-significant results is not necessary to invalidate these relationships. Since the number of studies directly influences this index, more studies are needed in this field to strengthen this construct.

Perceived service quality and consumer satisfaction

To measure the correlation between the perception of the quality of services provided from the adoption of AI and consumer satisfaction, the components present in the scales of the studies analyzed were grouped into four groups of relationships, that is, quality in the use of AI, quality in the service, quality in the systems, and quality in the results. Table 4 shows the quantitative relationships among the components.

As noted, all components belonging to this construct have significance and homogeneity ($p < 0.001$). Cohen's d values were considered very high (above 0.81), according to Cohen's (1988) standard, indicating an excellent adherence to the construct. Yet, the effects produced by the components can be considered negligible ($0.1 < r < 0.29$) and large ($r = 0.63$) when observing the relationship between quality in AI use with satisfaction in services.

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Table 4

Quality perception

Components	k	o	N	ES	d of Cohen	IClower	ICupper	Q	FSN
Quality in the use of AI	5	5	2580	0.63	2.44	0.59	0.66	609.39	63
Quality in the service	3	3	544	0.13	2.41	0.05	0.21	121.71	8
Quality in the systems	3	4	808	0.20	2.55	0.13	0.27	218.48	12
Quality in the results	4	4	957	0.24	2.55	0.18	0.30	258.77	19

Source: Elaborated by the authors.

On the other hand, NSF indices are not very relevant, demonstrating that with few studies that have significant results, the relationships evaluated are refuted. As reported in the previous construct, the low number of studies that address the variables grouped in this construct is a factor that influences the parameter of Rosenthal (1991).

Market orientation of service provision and consumer satisfaction

Table 5 displays the results found in the relationships between the marketing orientation of service companies that adopt AI in their processes and consumer satisfaction. The analysis of the studies resulted in the grouping of three components: performance, competitiveness, and financial advantage.

Table 5

Market orientation

Components	k	o	N	ES	d of Cohen	IClower	ICupper	Q	FSN
Performance	5	5	2257	0.57	2.55	0.53	0.61	610.29	57
Competitiveness	4	4	1979	0.49	2.51	0.45	0.54	514.74	39
Financial advantage	1	2	400	0.07	2.08	-0.03	0.17	24.01	1

Source: Elaborated by the authors.

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In parallel to the other constructs, the relationships between the marketing orientation and consumer satisfaction components showed significance ($p < 0.001$) and homogeneity ($p < 0.001$). Concomitantly, the effect size measured by Cohen's d can be considered very high, for the indices for the three components were: 2.55 (performance), 2.51 (competitiveness), and 2.08 (financial advantage). However, it is worth noting the very low adherence of the financial advantage component with satisfaction ($r = 0.07$), in contrast to better indexes presented in performance and competitiveness.

For an account of the small number of studies and observations, the fail-safe number indices were not high either. Turning to the financial advantage component, it takes only one study with non-significant results to disprove this relationship. This is because only one study with two variables measuring the financial impact of adopting AI in services and the relationship with customer satisfaction was diagnosed.

Identification with the service provided and consumer satisfaction

Given the quantitative measurement of the relationship between the individual's identification with the use of AI in services and consumer satisfaction, components were grouped for the analysis of this construct. Thus, the measurement components of the relationship studied in this topic are relationship, emotions, and environment, as shown in Table 6.

Table 6

Identification with the service

Components	k	o	N	ES	d of Cohen	ICIower	ICupper	Q	FSN
Relationship	2	3	474	0.13	2.76	0.04	0.22	154.00	5
Emotions	5	5	2890	0.76	2.67	0.72	0.79	880.59	76
Environment	4	4	2135	0.65	4.10	0.61	0.69	1016.47	52

Source: Elaborated by the authors.

The three component groupings of this construct proved to be significant and homogeneous ($p < 0.001$). It is also worth mentioning the very high representation of the effect size measured by Cohen's d, emphasizing the index reached by the environment component (4.10). Still, both the indexes reached by the corrected effect sizes are considered high in emotions

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and environment. In this sense, the emotions component stood out from the others by reaching an effect size of 0.76 when corrected for Fischer's Z, thus demonstrating its firm adherence to the construct.

Concerning NCFs calculated for this construct, for the relationship, emotions, and environment relationships, 5, 76, and 52 studies with null effects are needed for the effect sizes obtained by these components to reach the non-significance level.

AI use behavior in services on consumer satisfaction

The analyzed studies identified six components that are consequences of AI use behavior in services on consumer satisfaction. They are consumption experience, use intention, use objection, attitude toward AI, Loyalty, and purchase intention. Table 7 presents the components found.

Table 7

AI Usage behavior

Components	k	O	N	ES	d of Cohen	ICIower	ICupper	Q	FSN
Consumer experience	9	9	2558	0.67	2.66	0.63	0.71	773.80	120
Intention to use	4	4	2967	0.82	2.94	0.78	0.85	1068.12	65
Use objection	3	2	1044	0.30	3.40	0.24	0.37	441.09	18
Attitude towards AI	1	1	218	0.04	2.06	-0.10	0.17	9.61	1
Loyalty	4	4	1203	0.35	3.25	0.29	0.40	488.14	28
Purchase intention	3	2	1318	0.38	3.28	0.33	0.43	539.85	23

Source: Elaborated by the authors.

The six components found are significant both in their effect size ($p < 0.001$) and homogeneity ($p < 0.001$). The Cohen's d indexes are satisfactory, with highlights to the components: use objection (3.40), loyalty (3.25), and purchase intention (3.28). As for the effect of the relationships between the response components and consumer satisfaction, only attitude toward AI showed a weak effect ($r = 0.04$), both in Pearson's r and after its correction in Fischer's Z.

The highest fail-safe number found was with the component consumption experience (120), and the lowest was with the component attitude towards AI (1). These are the highest and the lowest presence of studies in

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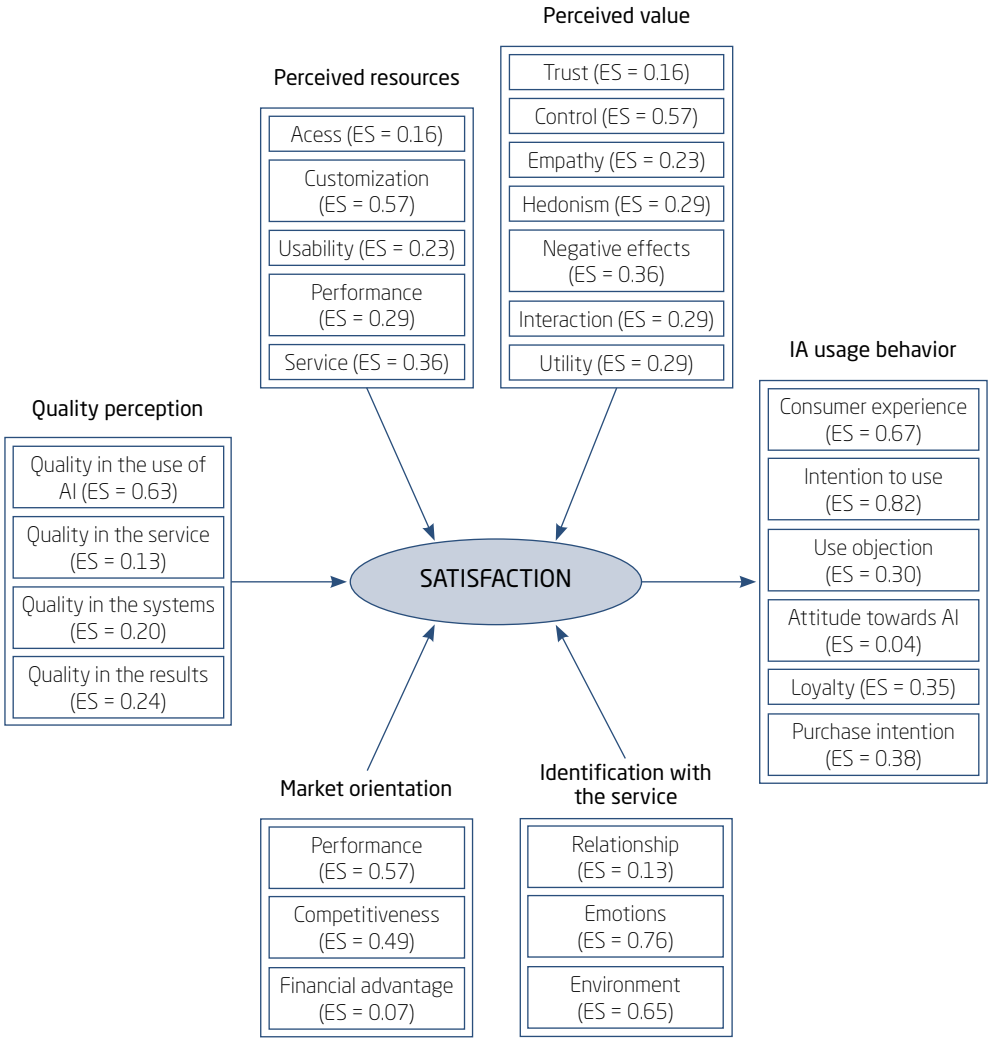
this construct, respectively. The others ranged from 65 to 18, demonstrating that more studies measuring the relationship between the use of AI in services and consumer satisfaction are needed in the area. These findings are more meaningful and less likely to become non-significant.

Figure 1 graphically demonstrates the results achieved in this article.

Figure 1

The theoretical model was generated from the meta-analysis



Source: Elaborated by the authors.

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According to the FSN results, the most significant opportunities for study are in the topics involving perceptions of tangibility, performance, and usability of the application of AI in services, as visualized in Chiang and Trimi (2020), Purwanto et al. (2020) and Chen et al. (2021). Also, in service quality themes, consumer perceptions should be further studied regarding the systems and outcomes arising from AI, as addressed in Payne et al. (2018), Trivedi (2019), and Moriuchi et al. (2021). As for the financial impact that the adoption of AI causes in the execution of services, only the study by Zeinalizadeh et al. (2015) was found, thus demonstrating the need for more work focused on this market orientation.

There was significance when the perception of the connection between the service and the consumer from the use of AI was observed. Still, more quantitative studies are needed in the segment to add information to the parameters found in Trivedi (2019) and Qiu et al. (2020). Finally, regarding usage behavior, the results of this article stress that more information is needed that points to the issues of objections to using AI in services and what are the attitudes of the consumer towards technology in this sector since only the articles by Payne et al. (2018), Gursoy et al. (2019) and Lin et al. (2020) quantitatively address these issues, making observations rare.

CONCLUSIONS

The objective of this article was to identify the main background and consequent constructs that make up satisfaction with the provision of services using artificial intelligence and their magnitudes. The importance of this study is due to the scarcity of meta-analytic research on the relevant topic and the possibility of viewing the last decade of empirical studies on satisfaction with AI in services with greater clarity and analytical robustness. Such a practical overview will serve service researchers and practitioners as a source of rich insights for further research and companies adopting AI.

For researchers, this paper can count as a guide in conducting and choosing meaningful constructs about satisfaction with AI in services, which emerged from the 106 independent components and 22 response components identified, forming the six constructs of analysis for this paper: perceived value, perceived features, perceived quality, marketing orientation, identification with the service, and AI use behavior in services. Other important themes associated with the consumption of AI-supported services may enrich the field and are promising avenues of research, namely: loyalty,

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engagement, trust, perceived risk, service failure and recovery, regret, propensity to use highly technological services, etc. Since these theories were not developed for in-service AI (Bock et al., 2020), the way forward suggests updating and adapting them in a way that puts AI in a central role.

To the industry professionals, this article provides an understanding of the landscape surrounding the satisfaction of customers who consume AI-supported services, offering an opportunity to understand the technological richness and complexity involved, focusing resources and attention, allowing them to make bolder strategic choices, and empirically justifying investments based on the relationship between constructs and critical components identified in this study.

In short, the findings show that consumer satisfaction in the provision of services is significantly correlated to the adoption of artificial intelligence. Hence, the analysis of the variables presented in the components has relevance for the evaluation of the performance of this technology over the years in the service sector. Thus, the integrated quantitative assessment that was conducted in this study aims to contribute key constructs and future empirical evidence in such a way as to increase the scope of studies on artificial intelligence and consumer satisfaction.

This research has limitations that suggest avenues for further investigation. It must be admitted that other databases were not used and may serve as a future reference for researchers interested in expanding the scope and soundness of the present study, namely: JSTOR, Emerald, PsycINFO, Taylor & Francis, Elsevier, Scopus, SciELO, and Ebsco. Furthermore, it may be enriching to add in future studies dimensions such as the price of the service, size, and sector of the service industry (hotel, banking, education, health care, etc.), type of benefit sought (hedonic or utilitarian), among other study characteristics and moderating factors used in studies such as Santini et al. (2020).

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