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Use of Electronic Receipts in Water and Sewer Service Customer Service: A Literature Review Article

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The general objective of this research was to understand the scientific evidence on the use of electronic receipts in customer service of water and sewerage service companies. A qualitative approach and a literature review were used, covering national and international studies. The instruments applied included content analysis of scientific publications. The main results indicate that the implementation of electronic receipts significantly improves operational efficiency and customer satisfaction. In Belgium and the United States, digitalization has reduced costs and improved resource management; in Peru, companies such as Sedapal have shown progress in reducing environmental impact and improving customer service through digital billing. However, challenges such as resistance to change and the need for adequate technological infrastructure are identified. The main conclusion was that electronic receipts in water and sewerage companies represent an effective tool to modernize management, increase customer satisfaction and promote sustainable practices.
Keywords: Electronic receipts, operational efficiency, customer satisfaction, drinking water services, technological modernization.

1. Introduction

The implementation of electronic receipts in EPS is crucial in improving operational efficiency and customer well-being and satisfaction; This study addresses the growing need to modernize billing processes, reduce costs, and promote sustainable practices that benefit both businesses and users.

At the international level, the implementation of electronic receipts in drinking water and

sewerage EPS has shown various results and challenges. For example, in Belgium, numerical optimization has been used to improve the structure of water distribution networks, reducing costs and improving operational efficiency (Vertommen et al., 2022). In the Netherlands, automated processing of customer complaints using electronic receipts has been studied, showing a significant improvement in customer service (Tian et al., 2022). In the United States, environmental and economic benefits have been reported with the use of electronic receipts, reducing the use of paper and improving expense management (SAP Concur, 2020). In San Antonio, Texas, the implementation of electronic water meters has allowed customers to monitor their usage and reduce bills, as well as decrease in-person service calls (Water News, 2022). Globally, the digitization of receipts in utilities continues to be a growing trend, albeit with challenges related to infrastructure and data security (SAP Concur, 2020).
A study conducted in the Philippines on service quality and customer satisfaction in electric utilities' online payment systems found that the security of online payment had the largest tangible effect on service quality, which directly influences customer satisfaction (Jou et al., 2022). Likewise, a report by the International Water Association highlighted how digital technologies, including electronic receipts, are transforming the water industry by improving resource management and customer satisfaction (Sarni et al., 2020). Finally, a study on customer attitudes towards digital wallet services in Bulgaria revealed that the adoption of these technologies not only improves and facilitates the beneficiary experience, but also increases what has to do with the competitiveness of companies (Ilieva et al., 2023).

At the national level, in Peru, the adoption of electronic receipts in drinking water service companies, such as Sedapal, has shown various advances and challenges. For example, Sedapal has implemented the digital receipt as part of its strategy to improve this service and reduce environmental impact; this change has allowed users to receive their invoices in advance and make payments online, which has improved operational efficiency and customer satisfaction (Zapata, 2020). Another article highlights that, although the implementation of digital technologies faces challenges such as resistance to change by some users, what benefits is the aspect of saving time and resources are evident (El Peruano, 2022). In addition, process automation and improved data management have been key to optimizing customer service (Ministry of Housing, Construction, and Sanitation, 2021).

That is why the main research question was formulated: What is the scientific evidence on the use of electronic receipts in the customer service of drinking water and sewerage service companies?

At the international level, there was research by Chopra (2022) who investigated the risks associated with the use of paper receipts in the retail industry of the United Arab Emirates (UAE), focusing on the environmental and health effects, as well as retailers' perception towards digital transformation. The research identified the high costs of printing receipts and a lack of awareness among retailers about the problems associated with paper receipts. He also explored the barriers and opportunities for digitalization, valuing consumer preferences and suggesting a comprehensive approach to the digital transition that considers the environment, health, consumers and business. Recommendations included support for retailers, government initiatives, and attention to consumer needs to facilitate this

transformation.
Likewise, Gration (2022) explored the current challenges in the collection of property taxes and proposed an information and communication technology-based solution to address these problems. Using a case study approach in Dodoma and Dar Es Salaam, data were collected from 150 building owners, 10 tax collectors and 10 system administrators through questionnaires and interviews. The findings revealed several challenges, including a lack of comprehensive educational programs for taxpayers, high collection costs, a significant number of delinquents, time-consuming payment methods, and impractical enforcement measures. To address these issues, the study proposed a framework that uses the Tanzania Electricity Supply Company's prepaid metering system to provide electronic property tax enforcement mechanisms, using the Scientific Design Research paradigm for its development.

In Peru, Ventura (2017) investigated the implementation of a web application to optimize the billing of sanitation and drinking water services of SEDA Ayacucho S.A. The company's Invoicing Unit is responsible for issuing and distributing physical receipts on a monthly basis, which involves significant costs for paper, printing, and payments to operators. The research, of applied type and descriptive level with a non-experimental and cross-sectional design, used the Iconix methodology and the .NET framework, integrating with the MVC pattern and digital signature. The results included functional requirements analysis artifacts, descriptions of use materials, robustness diagrams, sequence and design classes, as well as the project and/or material database schema. The developed web application sends water bills via email and text message to customers, improving notification and reducing costs.

Similarly, Lizonde (2017) developed research to implement a business intelligence methodology in the customer service area of the company EPS SEDACUSCO S.A., with the aim of obtaining the degree of Systems Engineer. The research applied information technology concepts in the organization's business processes, developing a strategy and selecting the right technology to create a new communication channel. This channel allows customers to check online for contracted drinking water services through the company's website. The implementation of the web system resulted in a "digital information flow" accessible in the computer system, thus improving access to services by users. The project had the collaboration of the administrative staff of the Commercial and Planning managements, as well as the Office of Information Technologies.

Finally, Chami (2023) conducted a study to evaluate the effectiveness of the service acquired by users in virtual attention with respect to commercial claims in SEDAPAR S.A. during the period of 2021, under the argument of the COVID-19 health pandemic. The relevance of drinking water and sewerage services was fundamental for public health. This research, with a quantitative, non-experimental and descriptive approach, used surveys administered through Google Forms to a model of 376 users who submitted their complaints in 2021. The questionnaire, consisting of 17 questions, used the Likert scale to evaluate the quality of the service in aspects such as reliability, response time, layout of the automation of virtual conduits, empathy and familiarity with these systems. The results showed that customers perceived the quality of the service as good, highlighting the accessibility of the virtual

platforms used, such as the call center, telephone lines, electronic message and virtual office, being especially accessible to customers who are between the ages of 18 and 35 years old, female.

In the context of the research, several key variables were defined; the first variable is operational efficiency, which measures how the digitization of receipts affects the EPS's internal processes and its ability to process resources effectively (Vertommen et al., 2022). The second variable is customer satisfaction, which assesses the level of acceptance and users' perception of the convenience and reliability of electronic receipts (Jou et al., 2022). Another important variable is information security, which considers the measures implemented to protect customers' personal data and transactions (Regneri, 2010). In addition, technological adoption is included, which analyzes the rate and elements involved in the evolution of users to digital receipts (Illilea et al., 2023).

One of the most relevant frameworks was the Technology Acceptance Model (TAM), which studies how beneficiaries come to accept and use a technology based on knowledge of the usefulness and ease of use of services (Venkatesh et al., 2003). Additionally, the Survival Analysis model was used to predict the probability of failures in piping systems, which is crucial for maintenance management and resource planning (Wang et al., 2022). Vygotsky's Theory of Social Systems was also used to understand how social interactions influence the adoption of new technologies (Vygotsky, 1978). In addition, the Numerical Optimization framework was used to improve the operational efficiency of water distribution networks, focusing on cost reduction and infrastructure improvements (Vertommen et al., 2022). Finally, the Theory of Planned Behavior was applied to analyze the intentions and behaviors of users regarding the use of electronic receipts, evaluating factors such as subjective attitudes and norms (Ajzen, 1991).

The research is theoretically justified in the Technology Acceptance Model (TAM), which analyzes technology adoption based on perceived utility and ease of use (Venkatesh et al., 2003). In addition, it is based on the Theory of Planned Behavior to evaluate the intentions and behaviors of users regarding the use of digital technologies (Ajzen, 1991). Also considered is Vygotsky's Theory of Social Systems, which examines how social interactions influence the adoption of new technologies (Vygotsky, 1978).

In a practical way, the implementation of electronic receipts in drinking water and sewerage service companies seeks to improve operational efficiency, reduce costs and increase customer satisfaction; This technological transition allows for more agile management of resources and makes it easier for users to access their receipts and payments, thus contributing to greater transparency and convenience in the service.

In view of the above, the general objective of research was to know the scientific evidence on the use of electronic receipts in the customer service of drinking water and sewerage service companies. Likewise, as specific objectives (i) to know the scientific evidence on the methodologies and approaches adopted in international and national studies on the implementation of electronic receipts in drinking water and sewerage service companies,

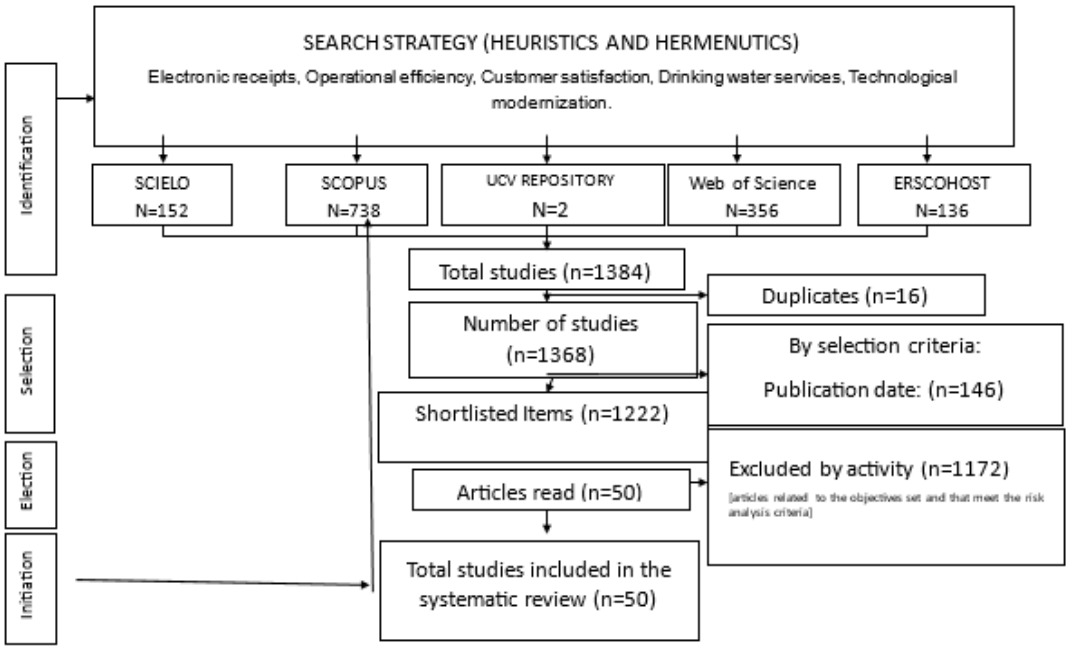
highlighting their advantages, disadvantages and results obtained; (ii) to learn about the scientific evidence on the impact of the use of electronic receipts on operational efficiency and customer satisfaction in drinking water and sewerage service companies.

2. METHODOLOGY

The research in this work was developed under a strict research protocol methodology, for this we use classifications as qualitative, as indicated by González (2018) who argues that this approach focuses on the analysis of social reality from the perspective of the individuals involved, with the aim of understanding the meaning that social phenomena and situations have for people in their respective contexts. Regarding the descriptive scope of the research, Martínez and Pérez (2020) highlight that this type of study is dedicated not only to collecting detailed information about a phenomenon without modifying its environment, with the purpose of describing characteristics, behaviors, or relationships within a specific group. These studies, which are also known as "correlational" or "observational," provide data on attitudes and behaviors of a given group, and can be cross-sectional or longitudinal, interacting with groups at a specific point in time or over time. For the design of the research, a non-experimental cross-sectional approach was chosen, where the variables will not be manipulated. According to Ramírez (2021), this design is considered cross-sectional because data is collected at a single time and in a specific place, with the aim of describing the variables and analyzing their incidence and interrelation at that moment, using a documentary approach. Finally, López and Torres (2019) mention that, currently, there are various techniques for data and information collection that can be applied to any type of research. To carry out this process of collecting data from reliable sources, both physical and digital databases are considered, especially reports issued by state entities that handle this type of documentary information.

From a methodological approach, this review article has compiled information from recognized and reliable databases, specifically in main sources such as Scopus, Scielo, WOS, documentary reports and theses, which are widely valued in the field of research. The review focuses on analyzing the factual scientific evidence related to the strategies implemented by organizations to improve customer service through electronic billing of drinking water and sewerage services. This analysis was carried out in a cross-sectional manner and a total of 1384 documents relevant to the topic were identified. However, 50 of them were selected, as their content is relevant to the research and is aligned with the variables of interest. In addition, the added value of this work is the type of sources selected, in this case it was oriented towards information from quartiles Q1 and Q2.

Figure 1 *Search Strategy based on a methodological heuristic*



3. RESULTS

For the research of the systematic review article, relevant information was collected from different reliable and central sources, employing methods of research protocol, research methodology, both national, international and local. These sources include studies related to the study variables in this article. The review of the literature made it possible to present the main results obtained and to demonstrate the traceability of the research objectives in recent years. According to the data presented in Table 1, a total of 1384 articles were examined. After reviewing the titles, abstracts, keywords and in some cases bibliographic references, 50 articles were selected for a more detailed reading. Of these, 50 articles were read in their entirety, but 1334 were excluded because they were not adequately contextualized with the topic. Finally, 50 articles were selected that allowed the objectives of this research to be met.

Table 1
Number of documents consulted

Fountain	Number
Found	1384
Selected when reading Abstract, Title and Keywords	1081
Selected by full reading	183
Selected for critical reading	120

Table 2 presents the results obtained in the literature review, taking into account that the database, 216 articles were from Scopus, 120 articles from Scielo, 2 articles from EbscoHost and 12 articles from ProQuest together with the UCV repository.

Table 2

Number of selected items

Fountain	Number
Scopus	738
Scielo/WOS	508
EbscoHost and UCV Repisitorio	138
Total	1384

Table 3 presents the results obtained in the literature review, the Scopus database was essential in this process, bearing in mind that only journals of high impact and traceability were considered.

Table 3

List of main indexed journals from 2019 to 2024

Database	Indexed journals	Year	Language
	Proceedings - 2022 International Conference on Artificial Intelligence of Things, ICAIoT 2022	2022	English
	Proceedings - 2024 Joint International Conference on Digital Arts, Media and Technology with ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunications Engineering, ECTI DAMT and NCON 2024	2024	English
	Utilities Policy	2024	English
	International Journal of Life Cycle Assessment	2021	English
	Lecture Notes in Electrical Engineering	2020	English
	Array	2021	English
	Journal of Cleaner Production	2020	English
	npj Clean Water	2019	English
	Sequence	2021	Portuguese
	TQM Journal	2020	English
	Utilities Policy	2020	English
	Lecture Notes in Computer Science (including subseries Lecture Notes	2024	English

Scopus	in Artificial Intelligence and Lecture Notes in Bioinformatics)		
	Environmental Science: Advances	2023	English
	Utilities Policy	2020	English
	Energy and Buildings	2021	English
	Proceedings - 2022 International Conference on Artificial Intelligence of Things, ICAIoT 2022	2022	English
	Proceedings - 2024 Joint International Conference on Digital Arts, Media and Technology with ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunications Engineering, ECTI DAMT and NCON 2024	2024	English
	Utilities Policy	2024	English
	International Journal of Life Cycle Assessment	2021	English
	Lecture Notes in Electrical Engineering	2020	English
	Array	2021	English
	Journal of Cleaner Production	2020	English
	npj Clean Water	2019	English
	Sequence	2021	Portuguese

Table 4 shows the articles selected for systematic review and full reading on citizen security, crime prevention, participatory security, crime prevention, and police modernization, which were published most frequently in 2020 and 2021, some of them in online publication (99%), followed by 2022 with 6%. With respect to the most recurrent language, the English language was obtained with a percentage of 98%.

Table 4

Articles selected according to the year of publication

	Year/Language	**Quantity**	**Percentage**
Year	2019-2020-2021-2022	36	72%
	2023-2024	14	18%
	Total	50	100%
Language	English	47	93.62%
	Portuguese	3	6.38%
	Total	50	100%

Impact on electronic invoicing in drinking water services provided by state entities

In the context of seeking results through a systematization process, we find those obtained mainly by Wolters Kluwer (2023) where he highlights that the digitization of invoices allows paper documents to be converted into digital format, facilitating their storage and management. Using technologies such as Optical Character Recognition (OCR), companies can automate the posting of invoices, which saves time and reduces errors in accounting management. This process is a pillar in the digital transformation of companies, improving operational efficiency and adaptability in a competitive environment (Wolters Kluwer, 2023). Docunecta (2020) points out that the digitization of invoices not only reduces the use of paper, but also transforms the document management of companies. Implementing a document management system allows you to store and retrieve documents instantly, automate workflows, and improve accounting efficiency. In addition, certified digitization of invoices provides legal validity, allowing companies to get rid of paper without losing integrity in their documents

On the other hand, the author Payhawk (2023) highlights that the digitization of invoices opens up a wide range of possibilities in business management. By eliminating manual data entry and facilitating integration with accounting systems, efficiency is improved and operational costs are reduced. Digitization also ensures that invoices comply with legal regulations, guaranteeing the authenticity and readability of the documents An author who has similarities to the previous one is Aitana (2023) where she mentions that the digitization of invoices involves the use of advanced technologies such as OCR and artificial intelligence to capture and process data efficiently. This process not only improves productivity by reducing the time spent on manual tasks, but also optimizes data management, increasing security and compliance with tax regulations.

Tickelia (2023) indicates that the certified digitization of invoices allows companies to scan paper documents and convert them into electronic formats valid with the Tax Agency. Not only does this save storage costs, but it also makes it easier to find and retrieve documents, improving operational efficiency and reducing management time.

Table 5

Books, theories, articles, reports, official publications, referring to raising the level of customer service, electronic billing, drinking water service, regulatory companies, taxonomy of water service.

Author / Year	**Impact of digital transformation**
Ajzen, I. (1991)	The theory suggests that a favorable attitude towards digital billing and perceived control over its use can increase consumer adoption of these services.
Chopra, S. (2022)	The transition to digital receipts improves payment accessibility and management, which can increase customer satisfaction in the utility industry.

CONCUR. (2020, February 3)	Digital receipts not only benefit businesses, but also reduce paper use, contributing to sustainability and improving the image of state-owned enterprises.
El Peruano. (2022, July 9)	The expansion of virtual payment modalities by Sedapal improves accessibility and convenience for users, which can increase the rate of payment compliance.
Ilieva, G., Yankova, T., Dzhabarova, Y., Ruseva, M., Angelov, D., & Klisarova-Belcheva, S. (2023)	An increase in the acceptance of digital services can facilitate the adoption of digital billing systems in the utility sector, improving the customer experience.
Jou, Y. T., Saflor, C. S., Mariñas, K. A., Young, M. N., Prasetyo, Y. T., & Persada, S. F. (2022)	A well-implemented digital invoicing system can significantly improve customer satisfaction, which is crucial for EPSs looking to maintain the loyalty of their users.
Lizonde Oviedo, B. B. (2017)	Digitizing customer service processes can optimize the consumer experience and make billing more efficient and accessible.
Ministry of Housing, Construction and Sanitation. (2021))	The implementation of payment fractionation options can ensure that obligations are met by users, thus improving collection and user satisfaction.

Benefits of e-invoicing vs user satisfaction level

The digitalisation of billing in the drinking water sector is a topic of growing relevance around the world, and several authors have addressed its implications for improving service and operational efficiency. Do not forget that it is oriented as one of the sustainable development goals in the world, As a fundamental result we are based on what is reflected by Idrica (2022) where it has decided through different studies to implement its GoAigua software in the commercial cycle of Sedalib, in northern Peru, with the aim of digitizing water billing for the benefit of local society. oriented towards the concerted development plans of the regions where this system is implemented. This project will encompass the automation of processes such as meter reading, billing and customer service. This initiative, which will be carried out within twelve months, is expected to benefit more than 200,000 users in the northern region, improving both operational efficiency and customer experience. For their part, engineers such as Wolters Kluwer (2023) highlighted the role that the digitization of invoices is a key element in the digital transformation of companies. This process allows for the automation of posting, which saves time and minimizes errors. In addition, it not only increases operational efficiency, reduces long-term costs, and sincere processes, but also improves customer service by offering faster and more accurate processes. The use of technologies such as Optical Character Recognition (OCR) is essential in this context. What really surprises and adds value as a result is providing digital solutions that optimize the management of the integral water cycle, guaranteeing quality and short-term results for both the service provider company and the end customer. The digitalization

of processes allows companies in the water sector to improve their response capacity and the quality of service provided to consumers. An example of this is how technology can transform water management and raise the level of customer service. Finally, Vásquez Silva (2023) mentions that the adoption of digital twin systems in non-revenue water management can help companies improve metering and reduce financial losses. These systems allow simulating critical situations and optimizing resource management, resulting in better customer service and greater efficiency in water billing, avoiding hidden costs, unnecessary lawsuits, satisfying a basic need such as consumption and mainly serving vulnerable populations.

4. Conclusions

✓ The digitalization of billing in drinking water companies, as evidenced in the implementation of the GoAigua software by Idrica in northern Peru, is configured as a fundamental and essential pillar for the digital transformation of the sector in our country. This transformation not only improves operational tactical efficiency by automating processes such as reading and invoicing, but also optimizes customer service, allowing for more agile, reliable and effective management of services. The adoption of digital technologies is therefore crucial to modernise the infrastructure and services offered to users, contributing to a better customer experience and service sustainability.

✓ With respect to the role played by service providers, a perspective on the automation of invoice accounting has to be generated, as mentioned in Wolters Kluwer's studies, this allows not only significant time savings, but also a reduction in errors in accounting management. Digitization facilitates more effective document traceability and improves workflow management, resulting in a more efficient and less error-prone process. This approach not only optimizes the internal resources of companies, but also ensures compliance with legal regulations, thus raising the level of service provided to consumers, in this part it should be mentioned that most companies providing these services would outsource this through outsiders or tertiaries, which do not necessarily provide adequate attention to the consumer.

✓ The incorporation of advanced technologies, such as the use of digital twins, data science and machine learning, elements that are current in our environment, can allow water companies not only to better manage resources, but also to adapt to an ever-changing environment. The ability to simulate and foresee critical situations in the management of non-revenue water, as highlighted in Vásquez Silva's work, is an example of how innovation can be used to improve the efficiency and sustainability of the service. Digitalization, therefore, is not only a trend, but a necessity for companies looking to stay competitive and offer a quality service in the water sector.

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