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ORIGINAL ARTICLE

Digital transformation and customer service management in dental companies

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ABSTRACT

Peru experienced an economic slowdown in various sectors, largely attributable to the global pandemic sweeping the world. This unexpected event highlighted the Peruvian economy's vulnerability to external *shocks* of such magnitude, causing disruption through the use of digital transformation across all sectors and forcing companies to adapt immediately. Therefore, this study aims to determine whether digital transformation is related to customer service management in dental companies. The approach is quantitative, applied, with a correlational design and a non-experimental approach. The technique used was a survey, with its corresponding structured questionnaire, to assess whether companies understand and apply the principles of the Fourth Industrial Revolution in their processes. Finally, hypothesis testing was conducted, concluding that digital transformation is positively related to customer service management. This allows companies to unlearn in order to learn, reinvent themselves, and adapt to new trends in effective digital communication with their customers, which provides them with growth and sustainability in the market.

Keywords: digital transformation; digital tools; digital channels; customer service management.

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INTRODUCTION

The Fourth Industrial Revolution has become a phenomenon that has generated major changes worldwide, having a positive impact on global competitiveness. Furthermore, across all sectors, it fosters significant changes in behavior to adapt to this digital revolution, which translates into new forms of communication and interaction. Through access to digital transformation (DT), citizens acquire new knowledge, which also benefits companies and organizations, as it facilitates communication through digital technological language between users, suppliers, collaborators, and customers. In this regard, Ledahawsky and Hernandéz (2022) concluded that, in Spain, business leaders are aware of this change and that adaptation is crucial for their organizations. As a result, professional profiles must show training, as they are the main driver of this transformation (Ledahawsky & Hernandéz, 2022).

As part of the vanguard and development of countries, digital transformation represents a great opportunity to address global challenges and respond to current trends. Furthermore, it drives economic growth and creates jobs with digital skills. In this way, it connects citizens to market services and job opportunities. Digital transformation plays a key role in keeping citizens, businesses, organizations, and governments interconnected (World Bank, 2024).

Reinforcing this assertion, digital transformation is an opportunity for all companies, which are increasingly interested in using it to gain competitive advantages. However, many do not implement it or lack relevant studies in their sectors, as is the case in Saudi Arabia, where 164 representatives from the service sector were surveyed. The findings showed that digital transformation significantly impacts customer experience, with correlations ranging from 0.555 to 0.859 and a significance level of 0.01 (Rawan and Basahel, 2023).

A study reveals that, in 2023, 67.0% of the world's population (5.4 billion people) was connected to the internet. "Estar conectados es la mejor ruta que nos lleva a la dirección exacta" [Being connected is the best route that takes us in the right direction] allowing businesses and society to advance with access to knowledge, leaving no one behind. This statement aligns with the UN Sustainable Development Goals (SDGs) (International Telecommunication Union, 2023).

In Europe, five large companies from diverse sectors (Lego, SAP, AGCS, 1&1, and Taifun) concluded that, despite the competitiveness of the digital age, digital transformation remains poorly understood by small and medium-sized enterprises (SMEs). Both research and practice struggle to provide practical guidance on technological adaptation. The feasibility of the SME strategy archetype is emphasized, as it provides SMEs with systematic and structured means to achieve their digital transformation goals, thus avoiding costly trial and error processes (Fischer *et al*., 2020).

"Industry 4.0: State of the Art and Future Trends" was published in Germany with the aim to present to industrial communities the current advances and future possibilities in the field of Industry 4.0. The technique used in this study was a survey, through which they concluded that there are numerous problems and challenges to be solved in this digital transformation (DT) process. They also highlighted the importance of addressing these opportunities to take advantage of their benefits in a constantly evolving sector, where companies must adopt new digital technologies that allow the application of cutting-edge techniques with an impact on industrial areas and ecosystems of the future. Furthermore, ICTs contribute significantly to the success of Industry 4.0 (Da Xu *et al.,* 2018).

Similarly, in Italy, research was conducted to determine which digital technologies support SMEs in the creative sectors in their customer knowledge management tactics. The study established three relevant conclusions: first, that companies use traditional technologies without considering the Fourth Industrial Revolution, due to a lack of knowledge on the subject and limited managerial involvement; second, that when it comes to marketing tools, they do not opt for cutting-edge solutions, avoiding various digital communication channels with customers; and third, that when it comes to digital tools for internet searches, a high percentage of SMEs use search engines (SEO) and search

engine marketing (SEM). Finally, SMEs consistently use and opt for traditional technologies, rather than opting for more innovative processes with greater advantages in terms of time optimization and customer loyalty (Castagna *et al.,* 2020).

It is important to note that digital transformation involves companies comprehensively, changing their business models through the adoption of channels and the implementation of digital tools. A study in Venezuela sought to determine the impact of digital transformation on competitiveness, concluding that its adoption is uneven across regions and that companies aspiring to be competitive must integrate digital transformation into all their processes (Salgado *et al.,* 2024).

Furthermore, the scientific paper "Evaluating the Relationship between Digital Transformation and Sustainable Business Excellence in a Turbulent Scenario" aimed to analyze the relationship between digital business model maturity and sustainable business performance. Through an online survey of 162 SMEs in the tourism sector from various continents, the study statistically demonstrated the significant impact of digital maturity on sustainable business success (Savastano. *et al.,* 2022).

It is important to note that digital technology currently influences human evolution and behavior, and is linked to the UN's 17 Sustainable Development Goals (SDGs). It is well known that digital technology will enable the development of the 45 least developed countries (LDCs), although it represents a challenge given the growing digital divide between them and the rest of the world (World Economic Forum, 2024).

In this way, digital transformation opens up professional development opportunities for women, people with disabilities, young entrepreneurs, and other groups marginalized from the conventional labor market. For companies, it provides platforms for managing comprehensive information on workers and customers (Organización Internacional del Trabajo, 2021).

It should be noted that, although digital transformation (DT) represents an opportunity, it has greatly affected its implementation in people, companies, and systems in recent years. This has especially forced companies to manage their businesses and the digital ways of relating to their internal and external stakeholders (collaborators, suppliers, consumers, clients, communities, governments, etc.). This is indicated by the research published in the *Journal of Business Integration*, where the authors conclude that this study expands the understanding of DT and various related research areas, such as the new digital skills required, the emergence of innovative business models, the evolution of key industries, and changes in consumer behavior. The research adds value by identifying the most relevant effects of digital transformation (Bresciani *et al.,* 2021).

It is important to analyze the factors that drive and hinder digital transformation in SMEs to identify implementation challenges. The results show that SMEs feel uncertain about how to begin their digitalization process. Although they maintain a positive attitude toward digital transformation, they face challenges such as a lack of resources, a low perception of external pressures, low intention to use, and limited adoption of digital technologies (Del Do *et al.,* 2023).

The Economic Commission for Latin America and the Caribbean (ECLAC) warns about the gaps in the adoption of advanced technologies such as the Internet in the region, a situation that is aggravated by innovative technologies such as artificial intelligence (Comisión Económica para América Latina y el Caribe, 2023).

In Ecuador, companies have identified digital transformation as an opportunity to improve the 21st-century customer experience. A study of 508 managers and customers concluded that microenterprises are willing to adopt digital technologies, including tools that improve customer experience and optimize service processes (Martínez & Ordoñez, 2024).

The investigation of Baculima *et al*. (2023) sought to identify the need for digital and cultural adaptation in companies. Through surveys of 89 companies, the results revealed a clear need to increase digital presence (29% dissatisfaction and 40% neutral responses). The study highlights the importance of alliances with technology providers and digital marke-

ting experts, as well as the need to implement digital strategies to improve visibility in local and international markets. The study found that 27% of companies face budget constraints and 18% lack sufficient knowledge, underscoring the need for training and financing options to adapt to the Fourth Industrial Revolution, thus improving their market presence. Ultimately, digital transformation is essential for companies, and measures need to be implemented to facilitate their adaptation and growth in the digital age in textile companies (Baculima *et al.,* 2023).

Understanding customer service management, perceived expectations, and satisfaction in the telecommunications sector is critical. Researchers examined these variables in relation to digital solutions and found a strong correlation (range of 0.554 to 1) between the three variables (Al Awadhi *et al.,* 2021).

Landing in our national context, the arrival of digital transformation (DT) in Peru, at crucial moments, has generated a disruption in our society and has become a necessity. Peru ranks 56th out of 64 countries in the Global Digital Competitiveness ranking, based on three pillars: technology, knowledge, and future-readiness. This aims for the country to adopt and explore these pillars as dynamic drivers in the economic transformation of companies. Therefore, the use of DT and 100% customer service management are key tools that allow companies to operate effectively and efficiently (Centrum PUCP, 2023).

In Peru, a study was conducted to determine the influence of digital transformation on personal banking customer satisfaction. The study's approach was quantitative, with a questionnaire administered to major banks in Lima and a sample of 384 customers. The authors concluded that process digitization and digital transformation significantly influence customer satisfaction (Chilet, 2019).

Likewise, organizations have a duty to reinvent or restructure themselves to offer digital services in line with current trends and demands. This prepares them for an environment shaped by the digital economy. Author Nicol Cueva aims to demonstrate the need for companies to reinvent themselves to respond to this context. Her qualitative approach, applied to university professors and business leaders, reveals a stagnation in investment in digital innovation and in the adoption of technological standards within companies (Cueva, 2022).

On the other hand, the requirement for companies to adopt digital tools has a positive impact on competitiveness, especially in the economic and financial sectors. For society, this generates positive change and social well-being, which translates into new forms of communication (Presidencia del Consejo de Ministros, 2020).

Likewise, the Peruvian government has enacted Digital Government Law 1412 and, on July 28, 2023, approved the Política Nacional de Transformación Digital 2030 (PNTD). This document establishes guidelines, objectives, standards, actions, services, indicators, activities, goals, and responsible parties to promote digital transformation in the country (Plataforma Digital del Gobierno del Perú, 2024).

Regarding customer service, this is a key aspect of organizational management and must be carried out efficiently and effectively (being where customers are, using digital tools) to provide the expected service. The authors conclude that service quality is based on customer expectations and needs (Rojas *et al.,* 2020).

Customer service is constantly changing. For years, the phrase "The customer is always right" has been heard in every retail sector, and it has become entrenched in our markets. Today, with customers' access to digital technology, this phrase dominates the market, leading companies to develop strategies centered on technology and new forms of communication, based on customer needs and satisfaction. Thanks to digital technology, omnichannel platforms are being implemented to improve tracking and understand customer tastes, habits, and preferences (Fernández, 2018).

This indicates that our country must work on backbone networks to integrate and connect all businesses and departments. There are regions in rural areas that are not only classified as poor, but where only 13.2% of households have internet access (Instituto Nacional de Estadística e Informática, 2021).

It is important to mention that if companies in Peru want to implement digital transformation (DT), they face several challenges. 48% are resistant to change, and 45% lack trained personnel (Escudero, 2025).

In the last ten years, studies have been conducted in information systems disciplines addressing topics such as digitalization and TD (Verhoef *et al.,* 2021), which shows a limited interest in examining advances derived from revolutionary technologies. The growing demand for transformation in products and services highlights the relevance of technology and offers opportunities to renew knowledge about TD (Cavalcanti *et al.,* 2022). This digital era has no limits in the adoption of disruptive technologies, which implies a significant transformation in the culture and processes of competitive companies. Therefore, a strategic vision is required that incorporates new methodologies, processes and organizational competencies. In other words, innovation, driven by management, that facilitates the offer of digital services and products to meet current customer needs (Morales *et al.,* 2023).

Digital transformation makes it possible to overcome the spatial and temporal barriers to obtaining information from any location, as it fosters the development of ecosystems and organizational networks. It also improves customer service management through the use of different channels or omnichannel solutions, resulting in competitive companies and economic circulation. Furthermore, it raises the standards of digital quality in customer service (Valderrama, 2019).

In this research's analysis unit, it was observed that some dental clinics operate with traditional processes or make partial use of digital transformation (DT). This generates economic crises in the 21st century, as they lack effective communication with their clients and fail to manage data or track services. The causes include a lack of technological infrastructure, a lack of digital communication about their services, and poor staff training in DT. The consequences are reduced competitiveness, profitability, and even business closures. This study seeks to provide strategic plans to integrate DT into service management, train professionals, and ensure the sustainability of the sector.

Finally, there are few studies focused on dental companies; these variables were only found in other sectors, as detailed previously. Therefore, we suggest the scientific community conduct future research at the local, regional, and national levels.

METHODS

The approach is quantitative, because it uses data collection to test a hypothesis through numerical measurements and statistical analysis, in order to confirm theories proposed by the researcher (Amaiquema *et al.,* 2019). Sampieri reinforces this theory by pointing out that this approach employs data collection, allows hypothesis testing, and is based on statistical analysis and quantitative measurements (Sampieri *et al.,* 2014). The type of study is applied, since, according to Sabino, it is carried out with a direct and immediate objective (Sabino, 1992).

The design is correlational, as it seeks to determine the degree of relationship between variables (Tamayo & Tamayo, 2003), with a non-experimental level, since these are not manipulated by the researcher (Kerlinger, 2002). Likewise, we worked with a finite, random and probabilistic sample of 35 dental companies in the Miraflores district. "Una población finita permite enumerar todos los elementos tangibles que la conforman" [A finite population allows us to enumerate all the tangible elements that comprise it] (Johnson & Kuby, 2008, p. 8). The random selection process was as follows: a population was identified, which includes the 51 dental companies in the Miraflores district that have an operating license granted by the municipality. For the method, a formula in Excel was used, where we listed the 51 companies; then, the random formula was used that gave a score to each of them, they were positioned from highest to lowest and the first 35 were taken into account.

Inclusion criteria were established: geographic, since Miraflores businesses are formal and supervised by competent entities, with customers demanding healthcare and processes services (clients of socioeconomic status

A and B); and professional, considering the dentists' experience in advanced dental procedures and their use of digital tools to meet client expectations.

We used surveys as the technique to collect data. According to Hernández *et al.* (2014), a survey collects information from individuals whose perspectives are relevant to the researcher. Casas *et al.* (2003) define it as a method that analyzes sample data to interpret characteristics through rational and complex procedures. The instrument was a structured questionnaire (20 questions on digital transformation and 12 on customer service), which, according to Sampieri *et al.* (2006), consists of a set of questions related to the variables under study.

To measure reliability, Cronbach's alpha was applied, obtaining a result of 0.849, higher than the acceptable value of 0.70 (Cronbach, 1951), which confirms that the instrument is reliable and has internal consistency.

RESULTS

In this research on dental companies, Spearman's correlation was analyzed with respect to the general hypothesis and its sub-variables (digital tools and channels), obtaining the following results:

General hypothesis

H1: Digital transformation is significantly related to customer management in dental companies.

H0: Digital transformation is not significantly related to customer management in dental companies.

As shown in Table 1, Spearman's Rho coefficient is 0.711. According to Spearman's correlation estimation scale, this indicates a strong positive correlation. Furthermore, the significance level below 0.05 confirms the relationship between the variables. Therefore, we can conclude that digital transformation is significantly related to customer service management.

Specific hypothesis

According to the results presented in Table 2, Spearman's Rho coefficient of 0.416 indicates, according to the corresponding estimation scale, a weak positive correlation between the

Table 1
Correlation of digital transformation and customer service management

Description		Customer service management	Digital transformation
Customer service management	Spearman's Rho correlation	1,000	.711**
	Sig. (two-tailed)		0.000
	N	35	35
Digital transformation	Spearman's Rho Correlation	.711**	1,000
	Sig. (two-tailed)	0.000	
	N	35	35

Note. Prepared by the author.

Table 2
Correlation of digital tools with customer service management

Description		Customer service management	Digital tools
Customer service management	Spearman's Rho correlation	1.000	.416*
	Sig. (two-tailed)		0.013
	N	35	35
Digital tools	Spearman's Rho Correlation	.416*	1.000
	Sig. (two-tailed)	0.013	
	N	35	35

Note. Prepared by the author.

variables analyzed. The level of significance obtained ($p < 0.05$) allows us to reject the null hypothesis, demonstrating the existence of a statistically significant relationship. Therefore, we can conclude that digital tools have a significant relationship with customer service management in the dental companies studied.

The results shown in Table 3 reveal a Spearman's Rho coefficient of 0.792; according to Spearman's correlation estimation scale, there is a strong positive correlation. Furthermore, the significance level is less than 0.05. This indicates a relationship between the variables. Therefore, we can conclude the following: digital channels are significantly related to customer service management in dental companies.

Figure 1 shows that 31% of the surveyed dental companies fully agree with the acquisition of software to manage their operational processes. In contrast, only 9% express partial agreement. On the other hand, 37% completely disagree with this technological implementation, while the remaining 23% partially disagree. It is noteworthy that the companies that expressed total or partial disagreement (60%) indicated that they exclusively use Excel spreadsheets to manage their processes.

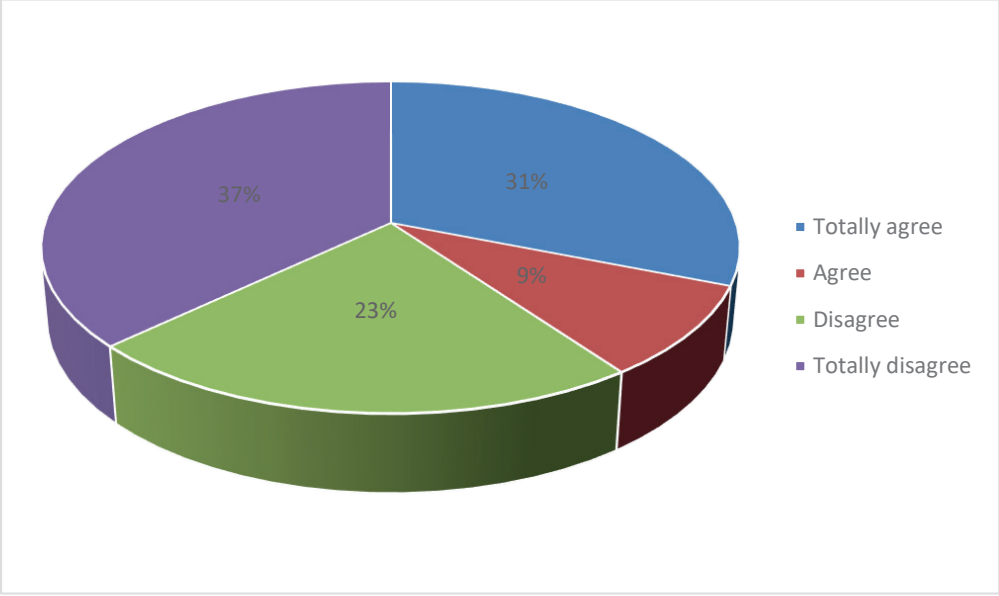
The results presented in Figure 2 reveal that 83% of study participants consider mastery of digital channels essential, demonstrating complete agreement with this statement.

Table 3
Correlation of digital channels with customer service management

Description		Customer service management	Digital channels
Customer service management	Spearman's Rho correlation	1.000	792**
	Sig. (two-tailed)		.000
	N	35	35
Digital channels	Spearman's Rho correlation	792**	1.000
	Sig. (two-tailed)	.000	
	N	35	35

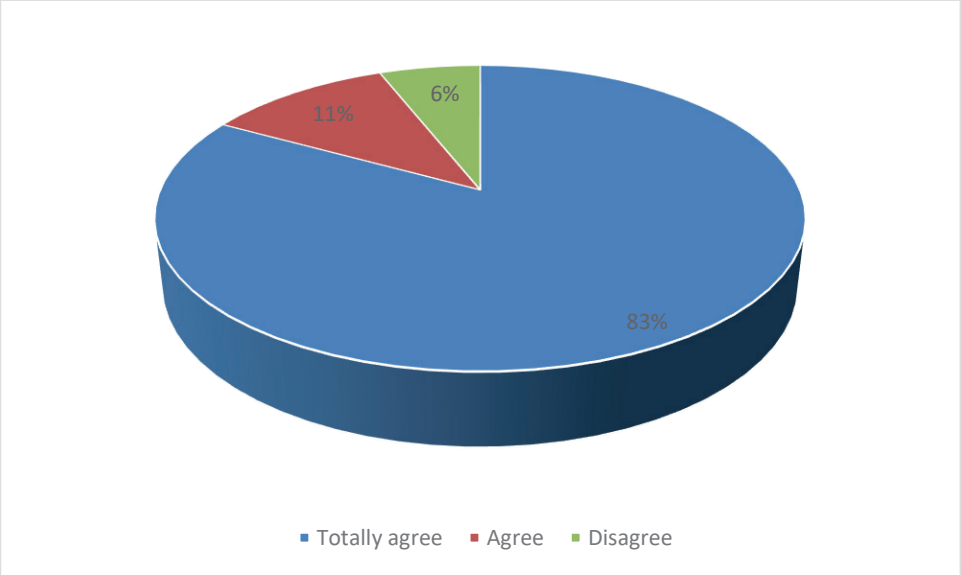
Nota. Prepared by the author

Figure 1
Software for business processes



Note. Prepared by the author.

Figure 2
Importance of knowing digital channels



Note. Prepared by the author.

Additionally, 11% of respondents expressed partial agreement. In contrast, only 6% of participants expressed disagreement or lack of knowledge about this concept.

DISCUSSION

The general hypothesis states that digital transformation is significantly related to customer service management in dental companies. The Spearman coefficient (Rho = 0.711) corroborates this, also showing a lower level of actual significance than the theoretical significance ($p = .000 < 0.05$). This implies a relevant and significant positive correlation between the variables of digital transformation and customer service management, suggesting that the greater the digital transformation in a dental company, the better its customer service management will be.

This finding is confirmed by Da Xu *et al.* (2018) in their paper "Industry 4.0: State of the Art and Future Trends," which indicates that there are multiple problems and challenges to be solved for industrial companies to adapt to digital transformation, and that all of them must take advantage of this opportunity provided by the digital revolution. Likewise, these results are consistent with the research of Rawan and Basahel (2023) in the services sector, who conclude that digital transformation significantly impacts customer experience.

Specific hypothesis 1 states that digital tools are significantly related to customer service management. This assertion is corroborated by Spearman's findings (Rho = 0.416), which also reveal a lower level of actual significance than the theoretical significance ($p = .000 < 0.05$). This implies a correlation between variables digital tools and customer service management, showing that the greater the use of digital tools, the better the customer service.

Chilet (2019) confirms this finding in its research entitled "Digital transformation strategies and their influence on the level of customer satisfaction in Personal Banking in the main banks in Lima", stating that companies are not up to date with trends in the use of digital tools with customers, which reduces their opportunities and competitiveness in the market.

Upon discussion, we conclude that the proposed hypothesis is consistent with our results, which show that digital tools are positively related to customer service management. This also confirms the consistency with the research by Martínez and Ordóñez (2024), who highlight the importance of implementing digital tools

in small internet service companies in Ecuador, such as the use of software and hardware to improve customer experience.

Regarding specific hypothesis 2, which postulates whether digital channels are significantly related to customer service management, Spearman's findings (Rho = 0.792) corroborate this relationship, revealing a lower level of actual significance than the theoretical one ($p = 0.000 < 0.05$). This implies a connection between both variables.

This result is in line with Castagna's *et al.* (2020) study entitled Customer knowledge management in SMEs facing digital transformation. The study shows that companies in creative industries use traditional technologies without taking advantage of innovative digital channels, which limits their adaptation to key technological changes for efficient management. For its part, Baculima *et al.* (2023) concluded that, in the textile sector, there is a clear need to improve online presence, with 29.0% dissatisfaction and 40.0% neutral responses.

Likewise, Fischer *et al.* (2020) highlighted that, despite the competitive demands of the 21st century, many companies are unaware of the advantages of technology in the market, showing little research capacity to optimize their processes. These findings cover sectors such as insurance, technology, telecommunications, toys, and food, and are consistent with the lack of technological knowledge observed in the dental sector analyzed. Similarly, Salgado *et al.* (2024) pointed out that digital transformation is uneven and that companies must accelerate this process to increase their competitiveness.

The findings show that companies use digital tools only partially to communicate with customers. In particular, the dental clinics surveyed are failing to adapt to the pace of globalization, reflecting their lack of preparedness for current demand.

Furthermore, these organizations are not ready to embrace digital transformation or adequately manage customer service. The reasons are as follows: managers, administrators, and dentists in the sector are unaware of the benefits of digitalization and its new service channels, and staff lack training in using disruptive technologies in customer interactions.

Limitations

The study had several limitations:

- Participant availability: Up to three visits to dental clinics were required, as in some cases respondents were available by appointment only.
- Veracity of information: It is important to note that some participants were reluctant to answer certain questions due to concerns about their company's image.
- Generalization of the results: Extrapolating the findings to all dental clinics in other districts or throughout Peru would be incorrect, as the study was limited to a sample of 35 companies in Miraflores. While this could introduce some bias, as often occurs in scientific research when delimiting the scope of the study, this work represents the first analysis to address these variables jointly in a little-explored sector. These results constitute a valuable contribution to future research, which could include surveys of workers or clients, apply qualitative or mixed methodologies, and apply data triangulation.

Finally, this research lays the groundwork for future scientific studies exploring the aforementioned variables, with the possibility of incorporating a third variable or adopting qualitative or mixed approaches. Additional research is recommended both in this sector and in other areas. Suggested topics for further study include:

- Digital transformation, perceived value and customer satisfaction.
- Disruptive digital technologies, professional profiles, and market competitiveness of companies.
- Digital transformation, digital culture, and business productivity.

CONCLUSIONS

The dental sector faces a challenge in adapting to the new trends offered by digital transformation, particularly in responding to the needs

of increasingly demanding customers. The companies surveyed must implement various digital communication alternatives and adopt a systemic and comprehensive approach, staying at the forefront of digital services. Therefore, these new forms of communication are redefining the way organizations operate to remain competitive in the market. There is extensive literature supporting the idea that companies that fail to adapt, innovate, and manage data adequately are doomed to failure. Added value and competitive advantage in today's market lie in developing digital capabilities across all processes and engaging the entire organization.

The surveyed dental companies state that they are considering digital transformation in their customer service processes. Regarding specific objectives: a) Digital tools: The surveyed companies indicated that understanding them is of utmost importance; however, 60% do not consider it important to use software for their customer management processes (a digital tool that allows them to centralize all customer and company information), and they do not have hardware on-site. Furthermore, a high percentage (63%) of companies use traditional technology, which reduces their opportunity to compete in the market. b) Digital channels: 94% of respondents indicate that they are familiar with digital channels and the benefits they provide for customer communication based on their environment. However, the reality of their customer communication processes is that 60% of dental companies only partially use digital channels to communicate with their customers, missing the opportunity to increase their customer base and position themselves in the market. Furthermore, they state that they do not use a platform for customer communication.

The importance of comparing traditional and technological trends, teamwork for their implementation, and the level of user satisfaction with digital channels are attributes that, when evaluated in organizations and the consumer market, allow brands to advertise, but also companies to increase their reach.

Finally, Peruvian dental clinics must overcome both technological and human training barriers. The digital age demands rapid care and quality of service, where effectiveness is measured by responsiveness. This creates the ideal scenario for testimonial marketing. Resistance should be dismissed, especially when limited financial resources are not a factor, as these are private companies with dynamic profitability. Therefore, it will be sustainable to the extent that success and prestige require updating, adaptation, and implementation of processes.

RECOMMENDATIONS

- Digital reinvention: Dental clinics are encouraged to adopt agile services through various technological communication channels, adapting to new trends in effective digital interaction. They should include specific objectives in their strategic plans to implement digital transformation in their customer service processes.
- Specialized human capital: It's essential to hire professionals with expertise in both customer service and digital tools. These specialists will be able to train the team in creating positive customer experiences—beyond simply offering products or services—which will generate greater loyalty. Additionally, they will be able to implement customer tracking and monitoring systems.
- Technological infrastructure: Companies must invest in appropriate digital tools (software and hardware). This implementation will allow them to: 1) maintain up-to-date information on all customers, 2) comprehensively manage business operations, and 3) generate reliable indicators from centralized data.

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Conflict of Interest

The author has no conflict of interest to declare.

Author Contributions

Karla Zamora Ruiz (lead author): conceptualization, research, methodology, resources, supervision, validation, visualization, writing (original draft, review and editing).