



THE ROLE OF DIGITAL TECHNOLOGIES WITHIN PHYSICIAN-PATIENT RELATIONSHIPS

Francisco Javier Morales Hernández¹: National Autonomous University of Mexico, México.
fmorales.jh@politicass.unam.mx

How to cite this article:

Morales Hernández, Francisco Javier. (2025). The role of digital technologies within physician-patient relationships. *Revista de Comunicación y Salud*, 15, 1-13.
<https://doi.org/10.35669/rcys.2025.15.362>

ABSTRACT

Introduction: Digital transformation, accelerated by the COVID-19 pandemic, has profoundly reshaped the doctor-patient relationship through the incorporation of technologies such as telemedicine and remote monitoring devices. **Methodology:** The analysis is based on the theoretical framework of the diffusion of innovations, allowing the exploration of how various elements of the communication system influence the adoption of digital technologies and sensor-based devices aimed at patients. **Results:** There is a growing empowerment of patients, who now have easier access to medical information and participate more actively in health-related decision-making. Recent studies also show an increase in the use of social media to seek medical information and growing trust in teleconsultations. **Discussion:** These changes pose significant challenges for studying doctor-patient communication, introducing new paradigms that require multidisciplinary approaches for proper understanding. **Conclusions:** The integration of digital technologies in the medical field not only transforms communication channels but also redefines traditional roles in healthcare, making in-depth and contextualized analysis of these processes essential.

Keywords

Doctor-patient relationship, digital transformation, digital technologies, health.

¹ **Francisco Javier Morales Hernández:** He holds a Bachelor's degree in Communication Sciences from the Faculty of Political and Social Sciences at UNAM and has nine years of experience in the digital industry, having worked in areas such as marketing, access to public information, internal communication, and human resources.

1. INTRODUCTION

The impact of the use and incorporation of digital technologies across different domains of industrial and personal life is a phenomenon that has developed alongside the so-called Fourth Industrial Revolution, or Industry 4.0. As a shift in the techno-socioeconomic paradigm of societies (De Propriis & Bailey, 2020), this concept has set the course for the development of interdisciplinary and multidisciplinary research. In the field of communication, these studies are increasingly linked with other areas (for example, health), giving rise to the construction of new theoretical frameworks aimed at understanding complex phenomena.

Taking traditional communication models as a starting point, these new theoretical constructions make it possible to frame the study of the pragmatic dimension through various forms of analysis. Thus, the study of the elements of the communication system—sender—channel—message—receiver—effects—must jointly address the effects of a phenomenon on the social relationships it influences, as well as the emergence of other aspects as part of its impact on political, social, and cultural domains of study.

Accordingly, a study on the impact of the incorporation of digital technologies into the doctor–patient relationship is particularly relevant, in light of the observed technological acceleration brought about by the COVID-19 pandemic. However, this revolution extends beyond digital devices as such. These implications also involve other types of actions, such as the use of social digital networks and the adoption of different practices in which the evolution of the service chain (new healthcare business models, political and/or commercial actors) has driven both healthcare professionals and patients to acquire a range of new skills that enable them to interact effectively in the digital environment.

1.1. The Doctor–Patient Relationship at Present

The doctor–patient relationship is a complex human interaction in which two types of outcomes are generated: tangible outcomes, such as diagnosis and treatment, and intangible outcomes, such as patient satisfaction or experience (Martínez, 2018). Its study is therefore based on two main ideas. First, that the communication models framing this relationship are rigid and unidirectional. Second, that the patient is increasingly gaining relevance in the dialogue during the medical encounter. In this regard, the first idea implies understanding that the healthcare professional possesses all the knowledge and authority regarding diseases and their treatment. The second suggests that the patient, due to access to health information on the internet and sensor-enabled digital devices, is becoming more aware of their health status.

Based on data from the latest study on internet user habits conducted by the Asociación de Internet MX (AIMX) and Knowsy A.I, 12.4% of internet users use social media as a means to search for healthcare services (AIMX & Knowsy A.I, 2023). Meanwhile, the Fundación Mexicana para la Salud indicates in its study on digital physicians in Mexico that 25% of doctors report that patients have influenced their prescribing decisions (FUNSALUD, 2022). This highlights a shift in the paradigm of the doctor–patient relationship in Mexico.

The above is merely the tip of the iceberg in the process of shaping the doctor–patient relationship within the digital environment. It is also necessary to incorporate into the analysis

political, economic, and cultural dimensions in order to determine the elements required for the study of communication in this relationship. In this way, structures and organizations are identified that shape, through parameters and rules:

- The behavior of the healthcare professional,
- The tools that must be used in the documentation process,
- The skills that must be possessed in order to fulfill the primary role (diagnosing and treating),
- The environment in which these actions must be carried out.

On the other hand, they delineate the aspects that determine access to healthcare services at the individual or group level (insured or uninsured), ranging from access to the service itself (public or private) to the acquisition of treatment supplies, as well as the monitoring and follow-up of diseases. This culminates in a shift in the perception of the model and of the concepts surrounding social action (the user experience of healthcare services), and the medical consultation per se (visiting the doctor).

Thus, taking as a basis the models of the doctor–patient relationship proposed by Emanuel & Emanuel (1999) —the paternalistic, informative, interpretative, and deliberative models— constitutes a starting point for the construction of a new model. This proposal involves the adoption of new practices by both the physician and the patient, with the aim of configuring a cooperative relationship. It seeks to move beyond the communicative format and the decision-making process, incorporating the circularity of information into the analysis and enabling the transformation of the traditional power relationship.

Figure 1. *The four models of the doctor–patient relationship.*

Modelos				
	Paternalista	Informativo	Interpretativo	Deliberativo
Valores del paciente	Objetivos y compartidos por el médico y el paciente	Definidos, fijos y conocidos por el paciente	Poco definidos y conflictivos, necesitados de una aclaración	Abiertos a discusión y revisión a través de un debate moral
Obligaciones del médico	Promover el bienestar del paciente independientemente de las preferencias del paciente en ese momento	Dar información relevante y realizar la intervención elegida por el paciente	Determinar e interpretar los valores del paciente más importantes, así como informar al paciente y realizar la intervención elegida por él	Estructurar y persuadir al paciente de que ciertos valores son los más adecuados, así como informarle y realizar la intervención elegida por él
Concepción de la autonomía del paciente	Asumir valores objetivos	Elección de, y control sobre los cuidados médicos	Autocomprensión de los elementos relevantes para los cuidados médicos	Autodesarrollo de los valores morales relevantes para los cuidados médicos
Concepción del papel del médico	Guardián	Técnico experto	Consultor o consejero	Amigo o maestro

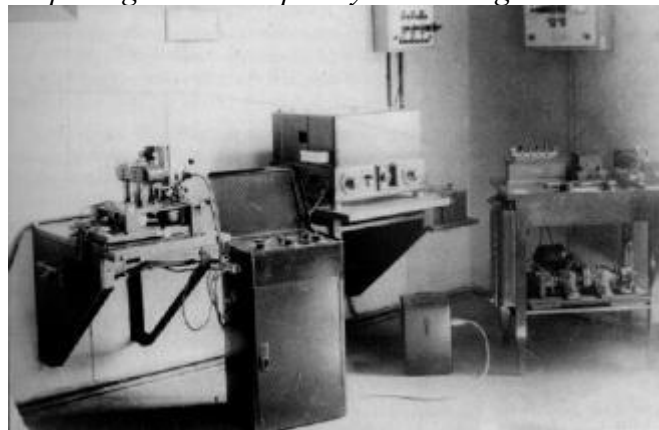
Source: Emanuel & Emanuel (1999).

1.2. Digital Transformation in the Healthcare Sector

As a phenomenon, digital transformation is a disruptive process involving the adoption of technology in various aspects of the daily lives of societies (Diamandis & Kotler, 2015). Within the field of healthcare, technological development is a constant, in which new ways of impacting the prevention and treatment of diseases are sought on a daily basis. Since the establishment of modern or scientific medicine in the second half of the nineteenth century —based on the scientific method as the primary framework for knowledge and medical practice (Pérez, 2003)— advances in methods and in different areas of healthcare, particularly in research and surgery, have aimed to improve patients' quality of life.

The development of digital technology in healthcare (or the digital transformation of the sector) can be traced back to the eighteenth century. For example, the work of Luigi Galvani (an Italian physician, physiologist, and physicist) on the discovery of the nerve impulse laid the foundations of biophysics, whose principles enabled the invention of the electroencephalogram in 1924 by Hans Berger (The Well Mind Center of San Antonio, n.d.).

Figure 2. *The electroencephalogram developed by Hans Berger*



Source: The Well Mind Center of San Antonio (n.d.)

Similarly, other types of technologies such as the electrocardiograph (1903), the automated external defibrillator (1950s), and the vital signs monitor (1960s) made it possible to observe the evolution and incorporation of technologies within the healthcare field. However, with the democratization of the use of devices and systems brought about by the emergence of the Internet in 1969 (ARPANET), the introduction of the personal computer to the market (1984 with the Macintosh), the invention of the World Wide Web (WWW) in 1989, and the launch of the first iPhone in 2007, the development of more personalized technologies was fostered. This transformation profoundly reshaped all industries, including healthcare, by impacting people's lives at a deeper level within societies.

Following this line of reference, it is possible to move toward a more specific analysis of the technological revolution brought about by the COVID-19 pandemic. While not necessarily in the invention of new technologies, it significantly accelerated their adoption. This, in turn, enabled a restructuring of the healthcare business model by facilitating the creation of an ecosystem in which both physicians and patients adapted their relationship to a new technological environment. In this context, an interconnection emerges among: (1) technologies used to

generate patient data and information (sensor technologies), (2) the tools required for the provision of healthcare services (hardware and software), and (3) additional services that replace traditional tools and processes (electronic health records, digital prescriptions, payment via transfers, and electronic commerce).

2. THE DOCTOR–PATIENT RELATIONSHIP IN COMMUNICATION STUDIES

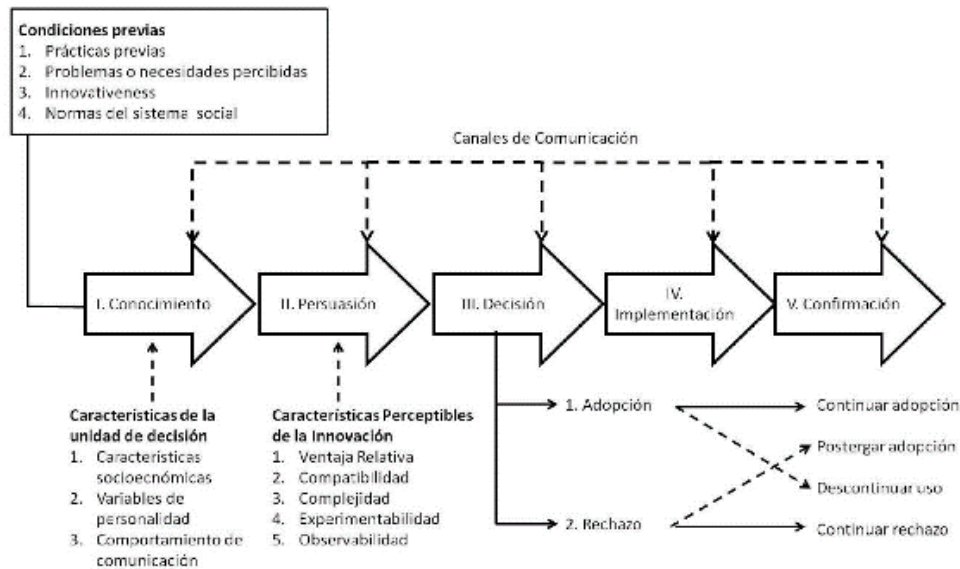
Communication studies address guidelines focused on the analysis of communicative phenomena, primarily mass communication, from which a series of postulates emerge that support the empirical observation of the communication phenomenon. Such approaches have made it possible to construct, based on these conceptions that people have held in the past regarding the relationship between reality and knowledge (Corvellec, 2013), the objects of research, defining their characteristics, processes, and elements. With regard to communication, models of study have evolved from the basic Sender–Message–Receiver (SMR) framework to more complex schemes, in which studies can be focused on different components of the communicative structure. For example, the communication channel, the effects of the message on the receiver, the paralinguistic language of the sender, and the content of the message, among others. Each component may be associated with a specific field of study, such as semiotics, hermeneutics, discourse or content analysis, and diffusion.

The latter is a type of research in communication that, since the early 1960s, has led scholars to investigate the transmission of technological ideas (Everett M. Rogers, 2003). Based on the diffusion of news through mass media, and by adopting the directive of the diffusion of ideas, this perspective within the field of communication takes on a more solid dimension by incorporating into its analytical framework areas such as sociology, medical sociology, or marketing, in the study of the adoption of innovations. These are understood as any ideas, practices, or objects that an individual (physician or patient) perceives as “new” (Rogers, 2003). For example, for physicians, innovation may represent new medicines or techniques, while for patients it may involve a medication, a family planning method, or a digital technology that provides information about their health status.

2.1. Diffusion in Health Communication

As mentioned previously, the diffusion of innovations is a field of study within communication focused on various elements of the communicative framework. Under the theory of the diffusion of innovations, Rogers (2003) proposes an analytical structure which, based on the communication model put forward by Harold Lasswell (who says what, through which channels, to whom, and with what effects), develops a theoretical proposal that clearly identifies the elements that can be studied within the process of diffusing an idea, practice, or object toward its use, adoption, adaptation, or rejection. In the field of health, among all the elements that comprise theory, particular emphasis is placed on the content of the message, the physician’s decision and capacity to innovate (Figure 3), and the patient at the individual or group level.

Figure 3. *Rogers' innovation-decision process*



Source: Rogers (2003).

Although in most cases the theory of the diffusion of innovations is used to determine categories of adopters (see, for example, Pongtanalert & Ogawa, 2015), the richness of this theory lies in identifying, within the basic communication model, the way in which the phenomenon can be observed and its correlation with the other elements of the system constructed.

Thus, within the message, health information constitutes the core upon which the different content guidelines are formulated, as well as the communicative skills of the physician (language and discourse). Innovations, understood as practices, ideas, or objects, can be situated within the content of health information that shapes the physician's message to the patient, thereby fostering in the latter the decision to innovate (i.e., to adopt the innovation). However, the use of digital technologies and access to the internet have transformed the communicative landscape, whereby the patient can also influence the physician's decision to innovate.

Examples of this can be observed in the way patients arrive at the medical consultation and interact with the physician. On the one hand, there are preconceived ideas about medications, treatments, or devices that may be effective in their implementation but unknown to the physician; on the other hand, there is the physician's effort to counter such configurations due to their lack of scientific grounding. Consequently, studies of the doctor–patient relationship constitute a body of research within diffusion—and therefore within communication—that provides clarity regarding the discursive and psychological processes involved in the construction and effects of the message. In this context, the theory of the diffusion of innovations represents an appropriate analytical framework in which health information is processed or constructed based on the innovations present within this relationship.

3. DIGITAL TECHNOLOGIES AS INNOVATION APPLIED TO HEALTHCARE

3.1. The Internet of Things (IoT)

Data acquisition represents one of the greatest assets of contemporary society. With regard to health, the monitoring and interpretation of clinical tests are actions that determine patient improvement. In this context, the advances enabled by the development of Industry 4.0 have provided digital devices (new technologies) with the opportunity to identify sensor technology as the point of entry and integration into patients' daily lives. This has facilitated the construction of an ecosystem at the individual level.

Referred to as “smart devices,” these technologies are generally connected to other devices or networks through various wireless protocols, such as Bluetooth or Wi-Fi, and can operate, to some extent, interactively and autonomously (Perakslis & Stanley, 2021). Among themselves, they enable the collection of statistical information regarding the behavior of a condition, thereby supporting corrective decision-making. Thus, Figure 4 illustrates the link between the body and digital devices that constitutes the foundation of the Internet of Things applied to healthcare, giving rise to a specialized subarea: the Internet of Medical Things.

Figure 4. *Digital Health Communication Model*

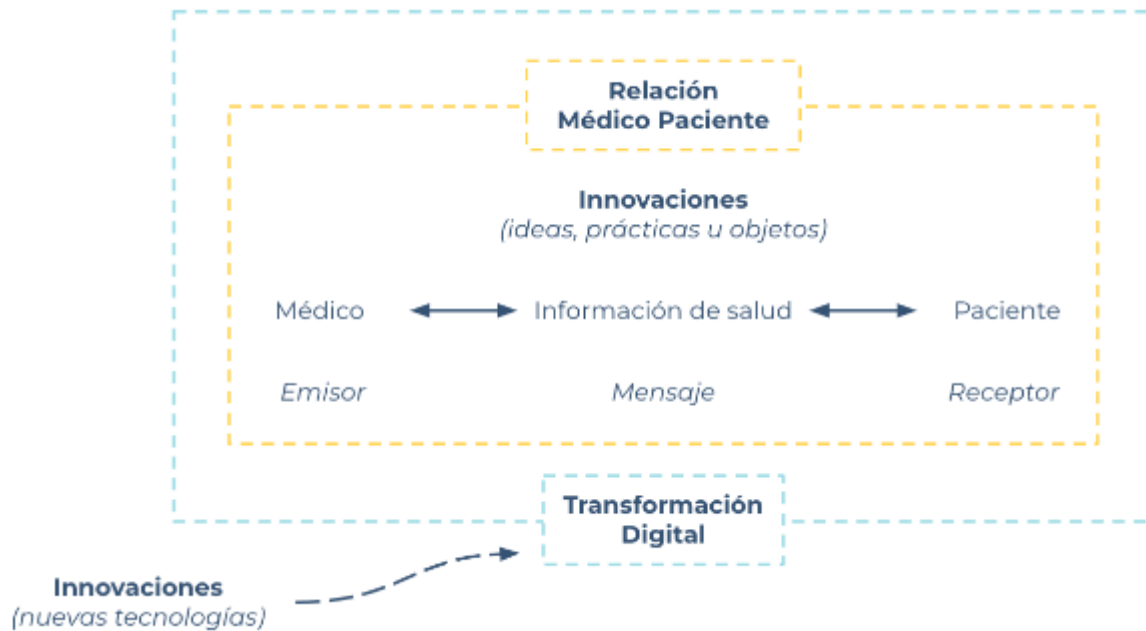


Source: Own's elaboration.

Although this technology was already available at the level of the healthcare system (the hospital), the development and integration of sensor-based devices into people's daily lives represented a step forward in incorporating a conscious decision-making process regarding the patient's state of health, providing the tools that enabled both the patient and the physician to bring about a change in the diagnostic process.

Viewed as innovations, these technologies are incorporated into the user's everyday life through the diffusion process. Figure 5 identifies the position of the elements within the communication system, where innovations arise from the framework of digital transformation and are introduced to the patient as a result of the patient's relationship with the physician within the process of information exchange.

Figure 5. *Conceptual triad: physician–patient relationship, innovation, and digital transformation*



Source: Own's elaboration

3.2. Socio-digital networks

Alongside data generation, the consumption of information by patients and physicians is an important aspect of the process involved in constructing the decision to innovate on both sides (see Figure 3). As a result of the context created by the COVID-19 pandemic, the use of socio-digital networks increased as a useful means of seeking health-related information. Based on data from the AIMX study on internet user habits for 2023 (the year in which the end of the pandemic was declared), nearly 13% of Mexican internet users use social media as a search tool for health services (AIMX, 2023). Likewise, as a contact tool, these platforms made it possible to strengthen digital communities in which individuals with various conditions found a channel through which to remain connected with others.

At the same time, physicians have found in this type of platform a forum that enables them to contribute to issues related to prevention, which may be linked to compliance with the objectives set out in the Declaration of Geneva regarding the sharing of medical knowledge for the benefit of the patient and the advancement of health (World Medical Association, 2017). In this regard, FUNSALUD states in its study *The Digital Male and Female Physician in Mexico* that 39% of specialists use social media on a daily basis to stay in contact with their patients, and 20% access these platforms daily to generate content as part of maintaining their social media profiles (FUNSALUD, 2022).

As an innovation, the adoption of socio-digital networks by the medical community led to an abundance of content on prevention and on the identification of symptoms that may form part of specific conditions. Likewise, it had an impact on the creative destruction and reconstruction of the medical image, shaping new scenarios and forms of language that enabled the observation of

the development of diverse informational and performative practices. In this way, these digital media function as a repository of health-related content and information available for consumption, allowing the medical figure to play a role in shaping patients' decision to innovate.

3.3. Digital devices for contact with the physician

Other digital technologies present in the development of this innovation adoption process are the devices that made contact with the physician possible. As tools that enabled the continuity of healthcare services, an information system was built in which the adoption of devices already used in people's everyday lives (such as laptops and smartphones) gradually incorporated additional technologies. This made it possible to configure a digital ecosystem encompassing the delivery of other services through the use of software such as videoconferencing applications (Zoom, Meet, Webex, Teams, which had previously been used mainly in business settings), software designed for the healthcare industry (such as the electronic health record and the digital prescription), and technologies related to service linkage (bank transfer applications and e-commerce).

In this regard, in Mexico, 40% of physicians use a specialized electronic health record, while 24% of those who do not use it (44%) report being very interested in beginning to use this type of technology (FUNSALUD, 2022).

4. DIGITAL TECHNOLOGIES IN THE PHYSICIAN–PATIENT RELATIONSHIP

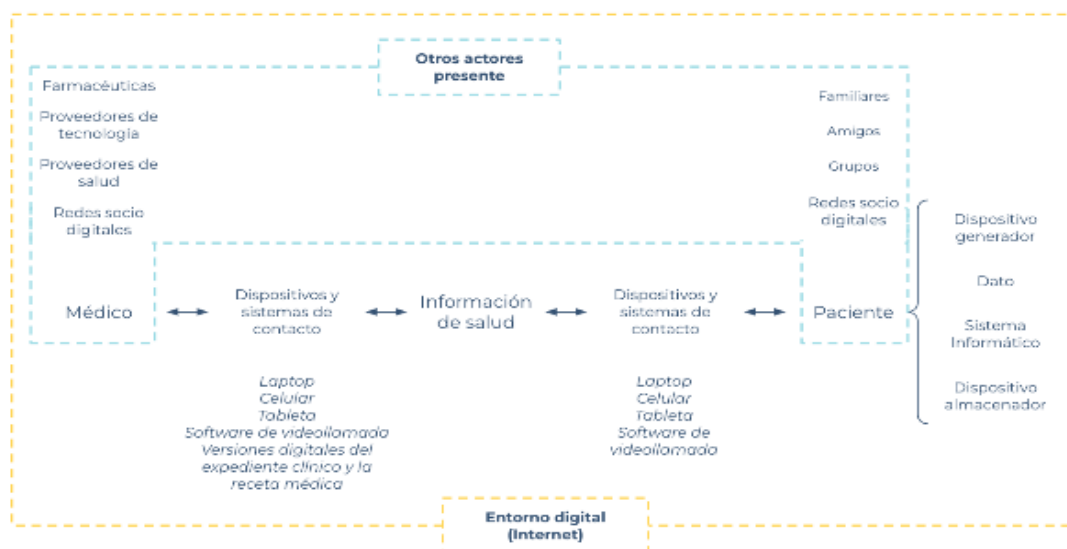
The phenomenon of the adoption of digital technologies in the physician–patient relationship was a gradual process that accelerated with the COVID-19 pandemic. With the declaration of lockdown, people with chronic illnesses such as diabetes or cancer, as well as the healthcare professionals treating these conditions, were compelled to view technology as the means through which to ensure continuity in the communicative processes between them. In this way, the replacement of processes such as auscultation with monitoring through devices such as the glucometer or the digital sphygmomanometer triggered a series of factors that affected different spheres of the personal development of both parties.

On the one hand, there was the economic dimension, involving the acquisition and adoption of the necessary devices to transfer the medical practice to a digital environment, as well as the purchase of data and internet services. Secondly, there was the political dimension, which made it possible to observe the degree of progress achieved at the system level in narrowing the gaps in access to digital services among different sectors of the population, as well as the development of public policy and social infrastructure issues that would enable such access to healthcare services, both publicly and privately, through telemedicine models. Finally, there was the cultural dimension, reflected in the phenomenon of information consumption regarding the control, diagnosis, and treatment of medical conditions across different media, alongside the reconfiguration of notions of medical practice in the digital environment.

With regard to the political dimension, it is worth noting that Mexico does not have specific legislation governing the use of digital technologies in healthcare. However, there have been isolated efforts, for example, to regulate electronic health record information systems through

NOM-024-SSA3-2012, with the aim of guaranteeing aspects such as the security of the information contained in these systems.

Figure 6. *Communicative system in the digital environment*



Source: Own's elaboration.

Thus, by schematically locating these economic, political, and cultural elements, Figure 6 shows the digital environment built through the internet. In this way, the different elements of the communication system are encompassed: on the one hand, the devices aimed at the patient, which are responsible for data generation and which constitute the health information directed to the physician; on the other hand, the devices and systems that enable contact between physician and patient, which function as the communication channels through which the message travels. Both aspects represent innovations insofar as they must be adopted as objects (the physical and electronic device itself), practices (with reference to the use of such technologies in everyday life), and ideas (which may trigger a further series of innovations in terms of the implementation or improvement of processes).

It is also possible to observe the other actors present within this configuration of the physician–patient relationship, who function as change agents or opinion leaders and may influence the innovation decision-making process of either party, thereby having an impact on the economic sphere of the system. For example, on the physician's side, there are those actors who form part of and shape the value chain of the healthcare business system, and who are responsible for generating and bringing innovations to the physician so that the latter may, in turn, become the change agent or opinion leader for the patient. Likewise, family, friends, groups (whether physical or online), as well as social media, are elements that help the patient shape their innovation decision-making process, as they are the ones who provide or introduce the idea of innovation through experience and/or the perceived benefits of its implementation.

5. CONCLUSIONS

The innovations present in the physician–patient relationship, beyond digital technologies, represent an analytical challenge insofar as this is a type of relationship in which many factors converge, and in which political and economic guidelines must make significant progress in order to achieve large-scale penetration of telemedicine systems in Mexico. This has been an outline of the role played by digital technologies in their incorporation and use by healthcare professionals and patients. Delineating the field of study from a theoretical perspective such as the diffusion of innovations invites the development of research focused on the different aspects of the components of this model and on the implications that may derive from it. Going beyond the mere generation of categories marks a turning point in innovating about innovations in communication.

In these respects, the diffusion of innovations in the field of communication and health presents various lines of inquiry. For example, at the economic level, there is the communicative effort involved in the development, deployment, and consumption of messages through electronic media. At the political level, there is the design of communication campaigns aimed at specific social groups for the adoption of new health-related uses and practices; without forgetting that, in order to incorporate the technological dimension, it is necessary to carry out a diagnosis of the gaps in access to different technologies. At the cultural level, there is the impact of health information on the power relationship that exists between physicians and patients.

Likewise, there are other subgroups of topics, such as information security in the exchange of data between communication systems, the protection of sensitive personal data, and the role of large pharmaceutical companies in the technological development of societies, among others, all of which have an impact on the multidisciplinary nature of communication and health.

Thus, observing a phenomenon must go beyond its novelty. Structuring a body of knowledge that contributes to the configuration of theories involving the multidisciplinary nature of phenomena is necessary in today's society. Combining methods of analysis, thereby enabling the generation of new knowledge on the basis of solid foundations provided by the history of ideas or the state of the art, should be not the beginning, but rather the turning point that leads us, as researchers, to innovate, that is, to ask: what lies beyond?

Taking the foregoing as a point of reference, it is now time to view communication no longer through the lens of traditional studies. Today, there are no longer passive masses. Viewed as a system, the physician–patient relationship has evolved from its origins in the magical conception of disease (Pérez Tamayo, 2003) to a reconfiguration of the power structure, by breaking with the unidirectional guidelines of health communication, in which access to information enabled the patient to become aware of their state of health and to play an active role in their process of improvement, by influencing the physician's decision to innovate, and vice versa.

This makes it necessary to revisit the normative foundation on which this relationship should be built, so that both physician and patient are aligned in the development of strategies aimed at improving health. As co-participants in a process, the adoption of innovations will represent, at a first level, a challenge for both parties. Secondly, these innovations will have the capacity to turn either one into an opinion leader or change agent, as a result of the experience acquired and lived

through in that process. Thirdly, they call for the structuring of a new basis for communication in which new elements are integrated to function as bridges, channels, and repositories of information among the different components of the communication system.

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AUTHOR

Francisco Javier Morales Hernández

National Autonomous University of Mexico

He holds a Bachelor's degree in Communication Sciences with a specialization in Advertising from UNAM, where he is currently pursuing a Master's degree in Communication with a focus on Technological Innovations. His professional experience includes work with the Internet Association MX and the Federal Consumer Protection Agency. He currently serves as Organizational Development Coordinator at Central Media, an agency specializing in health and wellness issues, where he is responsible for internal communication, process development and documentation in the area of human resources, onboarding management, and the attainment of certifications such as Socially Responsible Company and Great Place to Work. He has also received training in Pharmaceutical Marketing, Digital Transformation, Organizational Development, and Talent and Human Capital Management.

fmorales.jh@outlook.com

fmorales.jh@politicass.unam.mx

ORCID ID: <https://orcid.org/0009-0002-7478-965X>

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