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ABSTRACT

Information and communication technologies (ICT) have spread to all areas of human activity, ranging from administrative and public activities, to health care and information, to transport, to the protection of the environment. and the management of natural resources. We are witnessing the birth of new working methods that considerably transform the ways in which people work, which in turn leads to changes both at the level of organizations and hence at the level of the whole of society. society. IT has become part of the healthcare system that has seen the emergence and development of many applications with ICT. Experiences around the world are multiplying and theoretical debates are developing. It is in this perspective that our purpose will focus in this article on answering the following question: what are the contributions of ICTs to health in the light of their experiences of integrating them in the health field?

Keywords: Health System, ICT (Information and Communication Technologies), E-Health, ICT Diffusion and Integration.

Information and communication technologies (ICT) resulting from the convergence of developments in the computer, electronic and audiovisual sectors are defined as any means for collecting, entering, processing, and the dissemination of information in text, image and sound form. Technologies that have spanned all areas of human activity ranging from administrative and public activities, to health care and health information, to transportation, environmental protection and the management of natural resources. It is thus clear that all economic activity is thus modified. We are therefore witnessing the emergence of new working methods that considerably transform the ways in which people work, which in turn leads to changes at the level of organizations and hence at the level of the whole of society.

The rapid development of ICTs has therefore gained the health sector. IT has become part of the healthcare system that has seen the emergence and development of many applications with ICT. Experiences around the world are multiplying and theoretical debates are developing. It is in this perspective that this article proposes to answer the following question:

What are the Contributions of ICTs to Health in the Light of the Experiences of Integrating them into Health?

Thus, in this article, our first focus will be on understanding the state of the art on the theoretical debates around the contributions of ICTs, based on a presentation of the domains of integration of these technologies, which we lead us to examine the logic that animates the actors of this integration; and then we will present technology diffusion models to finally develop the contributions of ICTs to health and this will be supported by illustrations of experiences from OECD countries to better support the theoretical results.

Areas of Integration of ICTs with Health

The accelerated development of information and communication technologies has spawned new concepts in the field of health. These include:

1. E-health

Appeared in 1999 in the Anglo-Saxon countries so not very long according to the European Commission e-health is " the application of information and communication technologies 'ICT' to all activities related to the health. It is essential today as it appears to the shortage of health professionals with the difficulties in medical demography encountered in many countries using this e-health, improve the course patient management, coping with the chronic disease boom, and coping with the growing problem of dependency of increasingly aging populations.

2. M-Health refers to mobility

It came after the chronological evolution of ICTs in e-health and it is in 2005 that it begins to be used in France.

For WHO in 2009, it introduces a definition that refers to the practice of medical and public health on any mobile device like the phone, wireless technology namely connected objects.

3. Telemedicine

The third concept that has developed is that of telemedicine, a concept that joins the practice of medical remote so directly related to the health professional for the care of the patient under the French decree of 2010, five (5) acts telemedicine. The first being the medical regulation that materializes through the orientation of the patient by a doctor through a call center for the application for help and relief adapted to first aid, then comes the teleconsultation that allows a practitioner to do a remote consultation, the remote assistance that allows a practitioner to help another practitioner in a medical act, the expert expertise that allows a medical practitioner to ask another practitioner for help in the care a patient and telemonitoring that actually joins the M-Health since remote monitoring allows a practitioner remote monitoring of a patient either by analyzing medical parameters or vital parameters.

In addition, the e-health domains include the hospital information system, the patient's medical file, it includes telehealth, which could be understood as e-health but is not at the bottom because telehealth is all that is an online health service and therefore it joins all that is internet, the web but also the training of the practitioner, the information of the patients and the practitioners, but also what is called the serious-game which intervenes now in the e -health. Beside, we have the telemedicine previously defined, it joins the remote surveillance to which is added the house connected and home automation, to this is added the M-health thus the applications on mobile phone and the connected objects and it is necessary to distinguish between application mobile phones and connected objects since " a connected object is linked to an application on the phone very often and finally robotics not really developed in medicine but which we begin to think uses such help to patients in difficulty who joined a little Help with addiction. The field of e-health is as confused as it is imbricated and in continuous evolution.

The domains of e-health are as confused as they are imbricated as shown in the previous diagram, the craze for these technologies of the different actors of the health system presents more than an argument to see their domains diversify and in continuous evolution.

The Logic of Implanting ICTs in Health

The contributions of the literature teach us that the precursors to the integration of ICTs in health justify their recourse to them, by their will to enjoy the same benefits and publicized contributions of information and communication technologies; namely saving time, reducing distance or even totally ignoring it, productivity gains; all significant of a cost savings.

But health is a socio-economic sector in the sense that it is at the center of an economic circuit that receives financial flows in exchange for an intangible production that is the welfare of the population; and the latter is an undeniable social component of economic life because knowing all health has a cost but is priceless. This being the case, the criteria for assessing the production of this service, which is the supply of care, are efficiency, efficiency, equity and, recently, quality of service. The issues that will fuel differences in the debates on the contributions and impacts of integrating ICTs into health will be based on whether or not these basic criteria of the underpinning of any health system are respected.

The Studies from the Quebec and Canadian experience argue that the underpinning of ICT integration in health is rooted in the willingness of the respective government to reduce budget allocations to health. For these funds, the computerization of health has been invested with the capacity to structurally increase the performance of the health system, by increasing the productivity of medical work. This is part of a purely technical-economic logic that underlies the massive integration of information and communication technologies in the most costly positions in order to curb them. While in Europe, among others, in France, public authorities have undertaken a socio-economic integration of integrating ICTs not only in the health sector but on a larger scale to encompass the whole of the social life of the people. citizens and where the initiating State of change and project calls on industry to advance the process of social computerization through structuring actions.

Differences in the ways in which ICTs are integrated and adopted into health through the various experiences in the world illustrated by the French case and the Canadian case lead us to question the underlying arguments of their modus operandi. to the implementation of ICTs in health systems, which we have identified as follows:

The divergences between these two logics are rooted in the very perception of ICTs and the objectives assigned to the integration of ICTs into health systems. Indeed, experiences around the world in the field of the integration of information and communication technologies bring out two logics whose reasons are fundamentally opposed because one is based on purely economic reasons for productive imperative and responding to a techno-centered approach guided by a substitutive logic and the other aiming at a creative imperative supporting a medico-integrative logic.

Technico-Economic Logic

This logic aims at a productive imperative because it is generally sponsored by the decision-makers who give an essentially budgetary and operational role to the information and communication technologies. One of the fundamental aspects of this logic is to implement ICTs in health sector organizations in order to better control the costs of care services through increased surveillance of medical work. In this logic it is question for the health professionals to carry out their tasks within the planned and standardized planned limit. This means that it is a question of forcing the practitioners of the medical function to conform and to submit to what is already conceived and programmed by the managers who privilege in their approach of implementation of the TIC of type TOP-DOWN or technico-economic which aims to control the realization. The managers thus require healthcare professionals to use ICTs to control their daily practice, with the aim of restructuring, re-articulating medical practice around standards determined by managers who define and design what needs to be done, how to do it?, how fast do it? And for what purpose?

This logic of implementation of ICT in medical practice has been a vector for the renaissance this time in the health sector of Taylorism, which we know already knew its limits in the industrial organization. This Tayloristic vision of medical work developed through the use of ICT, allows an intensification of the medical work that results from a remote task planning by the decision-makers for whom health professionals become mere performers. For decision makers who opt for this logic of ICT implementation in the health sector, ICT will necessarily contribute to the increase of the productivity of the medical work which is in their view the main indicator for the evaluation of the effectiveness of ICTs in health sector organizations. The expectations of the decision-makers in this logic are purely financial, which suggests that the economic reason was substituted for the clinical reason in the evaluation of the performance of ICT in organizations in the health sector. In other words, their expectations related more specifically to the improvement of economic performance rather than to clinical performance, although these are underpinned in the process.

Moreover, this logic of design and implementation of information and communication technologies in organizations in the health sector is based on a "technocentric" vision aimed primarily at the internal coherence of the system and its adequacy with organizational and organizational requirements without being concerned about integrating the knowledge and practices of the various users of these technologies The illustrative example of this logic remains the observation made on the ground in this case in a Quebec emergency department conclusion made "Rather than idealize the technique, it must be trivialized; rather than operating by substituting old practices for new ones, we must cling to existing practices; rather than designing for a model-user, one must meet the actual users. "

Medico-Integrative Logic Supporting "A Creative Imperative"

Contrary to the economic logic, developed and supported by the decision-makers, which suggests that the imperative sought in the integration of ICTs to the organizations of the health sector is purely economic, both in the search for the improvement of the productivity of the medical work done by health professionals and at the same time the support of operational objectives contained in the reduction of the costs of the health services; in medico-integrative logic, it is health professionals who suggest the use of ICT to improve their practices in order to improve the service rendered to the patient in terms of time, quality but also relevance of the care service delivered to the patient. they generally believe that "ICTs must first and foremost provide support for clinical practice", which translates into their belief that the relevance of technologies in the health sector is assessed in terms of their ability to improve the quality of medical work and, as a result, the quality of patient care services. However, the possibility of saving savings is not necessarily considered as antagonistic with the quality of the care, it is the quality of the service offered to the patients and the purpose of use of it, namely to improve the state of health. patient's health, which matters above all else.

For healthcare professionals, through the use of ICTs, they can be more efficient clinically and therapeutically.

Thus, they start from the idea, or principle, that the quality of medical work through ICTs will have a direct impact on the quality of patient care services, from the moment that health professionals can better utilize their expertise to improve the health of a given patient. It is thus a conception quite opposite to that of certain decision makers who postulate that the increase of the productivity of the medical work, passes by the intensification of the latter. And this has led us to question the different modes of diffusion techniques which are divided into three models as follows:

Models of Diffusion Techniques

The notion of diffusion, whatever its object, is central to any system or social construction, because it is at the base of the coherence of the behavior of individuals or their representations, and therefore the coordination of their actions. As such, it is a major concern in particular in economics, sociology and the humanities and social sciences, and what is situated in a behavioral or cognitive perspective.

The basic principle behind the notion of diffusion is that interactions between individuals are the main driver of the evolution of their behaviors, beliefs or representations. These interactions can be, from individual to individual, which means that the latter are direct or indirect interactions, that is to say relayed by a media or an institution (newspapers and advertising, parties and unions, market ...). Whether it is the adoption of an innovation or a new idea, the propagation of an opinion or the seduction of consumers, it is clear that the

two types of interaction are generally the work and combine their effects to guide the evolution of individual states.

In terms of ICT diffusion modeling, there are three models that need to be taken into account as they give an important place to information and communication. The "model of diffusion" proposed by Everett T. Rogers in 1962 in his book The Diffusion of Innovations.

The author wonders, in particular, about the conditions of adoption of a new hybrid maize variety by farmers in Iowa. It establishes the decisive importance of social communication structures in the decision-making and adoption processes of innovations. Diffusion, according to this author, occurs in stages according to certain factors favorable to the adoption empirically revealed, by individuals with personalities and belonging to very distinct social categories. The dissemination process is based on a five-step model: knowledge of knowledge, persuasion, adoption decision (or rejection of innovation), implementation and confirmation. The model emphasizes the importance of communication channels in the adoption process. The mass media, particularly adapted to the first stage (information) by the width of the audience they reach and the simultaneity of the diffusion, are supposed to be able to modify the anchored attitudes. But it is especially the interpersonal channels that are more effective in countering ideas or deep-seated habits and apathy that allow exchange and combat psychosociological barriers. They are thus better suited to the second stage (persuasion) than the mass media. This explanatory model was amended by E. Rogers and L. Kincaid (1981). To the old diffusionist model, which is considered too mechanical, they replace the analysis of the communication network and the process by which participants in it create and share information in order to arrive at a mutual understanding.

The Model of the Translation

(proposed by Mr. Akrich, M. Callon and B. Latour (1988, 1988))

Following criticisms of diffusionism, they draw inspiration from the work of the English Schools of Edinburgh and Bath. Working on the study of scientific laboratory work and the design of technical innovations, they establish the importance of negotiations between actors. This model is based on a socio-technical approach and proposes a strategic analysis of innovation (incentive strategy). Negotiating is actually redefining, rehabilitating, translating the needs, demands, and social characteristics of those to whom innovation is aimed at technical characteristics and vice versa. Thus adoption is synonymous with adaptation. This process takes place through an operation: translation. Translating is moving, but translating is also expressing in one's own language what others want. The objective is to aggregate interests. What is the success of innovations? The art of interesting a growing number of allies that makes the project carrier stronger and stronger. To that of enlisting actors and choosing the right spokespersons. The communication takes place thus mainly in a dialogical framework.

The Socio-Economic Model

This model is formalized little by little by French researchers (Miège, Moeglin) and Quebecers (Lacroix, Pronovost, Tremblay) in various publications both in France and in Quebec. Favoring the anteriority of the industrial offer, these researchers have identified stages that periodize the process of implantation and formation of uses:

1) The elaboration of the social computer project where the State plays the central role
2) The establishment of a technical standard and the assumption by industrial actors of the concrete realization of the project
3) The development of a prototype and its social testing which makes it possible to refine the technical proposal
4) The beginning of the socialization of the new technology by large scale experiments, general public, which marks the entry on the scene of the users as actors really active in the course of the process
5) The first phase of marketing, during which the development of the offer, particularly at the content level, is pursued, whereby the supply is given a critical mass of consumers, which will enable it to legitimize its efforts to generalization
6) The generalization that takes place without the entire population being affected and which merges with a movement of diversification and penetration into a broader set of social practices. Thus, step by step, the actors (State, industrial ...) advance the process of social computerization through structuring actions. Researchers indicate that in three out of six stages, the discourses deployed play an important role: Stage 1 - politico-prospective speeches; Step 5 and 6 - prescriptive speeches and prescriptive actions (Lacroix, Tremblay, Pronovost, 1993). Speech is therefore a decisive element in the process of diffusion and adoption of innovations and techniques. What are the contributions of discursive production to the diffusion of t around the world, mainly in Canada and Europe, has been the subject of several scientific productions that have explicitly linked the infatuation that is pervading decision-makers in health sector modernization processes by integrating NICT, to an exclusively favorable positioning of the techniques.

Although part of a strictly economic logic namely the reduction of health expenses. The projects launched in Quebec "the computerized outpatient shift in Quebec," as BONNEVILLE pointed out to us, "the overall computerization of the health sector, as put in place by the Quebec government in the 1980s. ten, was not based on a concern for modernization in itself, "neutral", of clinical practice. Computerization was first and foremost only one means among others, for example the reduction of public health expenditure, to solve some key problems facing the Quebec health and social system. These problems, mainly budgetary, legitimized the way in which the health sector in the 1990s was

computerized. The Quebec government has indeed relied on the need to curb the growth of public health spending to advocate computerization of clinical practice that can lead to increased productivity of health professionals. This alone made computerization a must. "

For the same author, attempts to control public health expenditure in most advanced industrialized countries since the early eighties, have resulted in a political will to increase the productivity of medical work to make it less expensive. . Given the weight of public health expenditure in GDP, health care services were an interesting target for government authorities who mentioned the presence of productive sources that needed to be exploited. According to the proponents of this speech, it was a question of substantially reducing public costs of care services by using industrial mechanisms to increase productivity to structurally transform the objective conditions of medical work, the clinical management of patients and how to access care. Through this project, we sought to impose the preeminence of economic reason on the clinical reason. However, this productivist logic was going to be confronted with the resistance and the opposition of another logic, which we call logical of clinical and therapeutic efficiency, which according to the health professionals must organize the services of care. The author shows that this opposition reveals an incompatibility in essence between the economic reason and the clinical reason, between the economic purpose of increasing productivity and profitability and the very nature of the care services which is in the very purpose of their use.

Moreover, in the writings of Ellul from a second positioning of ICT in health and to which a number of authors will adhere, it denounces the strictly positive publicization of the integration of ICTs to health and introduces the concept of "technological blueprints". As early as 1988, he emphasized in his book entitled "Technological blueprints" that the discursive productions that accompanied the diffusion of techniques revealed a favorable positioning for the development of ICTs and included a trilogy: Challenges, Enjeux, Paris.

In his book the author proposed to examine what was covered by the notion of "technology", which he related to the "discourse on the technique." He then indicates that it is the speech that participates in "... bluff gigantic, ... And it is a matter of bluffing because in this discourse the effective possibilities of techniques are multiplied by a hundred and the negative aspects are radically hidden".

For Wilson (1988), it is almost obligatory that discourses on techniques continue to develop. This author insists on the need to analyze the discourses that make it possible to talk about technology in the future. Indeed, for him, any critical evaluation of new technologies requires first of all an understanding of the discourses that deal with technologies. Thus, discursive productions were intended both to participate in technological bluff and to legitimize ICT decisions.

The Contributions of ICT Integration to the Health Sector

The review of the abundant literature on the adoption of Information and SCommunication Technologies (ICT) in the economic and social life of man

continues to highlight the complexity and diversity of the impacts of the latter. are important reasons for their interest. However, these same characteristics also help to explain why measuring the impacts of ICT is not a simple task, and the major reason why the impacts of ICT are difficult to measure is the fact that any impact of a factor on another is difficult to highlight because a positive correlation is not easily attributable to a cause-and-effect relationship.

Thus, a source of complication is highlighted by the fact that ICTs are comparable in their impacts to that of electricity: "The difficulty comes partly from the fact that ICTs, like electricity, are technologies" of or "multipurpose", which means that their use and impact are ubiquitous but difficult to measure because they are essentially indirect. It is not electricity per se, or ICTs that primarily affect the economy and society, but the way they are used to transform the organization, processes, and behaviors".

The analysis takes into account the characteristics of health care systems in OECD countries as well as other relevant pieces of documentation and information needed to understand the similarities and differences in the strategies undertaken, and to assess possible advantages and disadvantages of measures and frameworks that affect the structure, design, implementation and results of different programs and projects. The conclusions are illustrative of the benefits that can be expected from the implementation of ICTs in the health sector in relation to four broad and interrelated categories of objectives, as follows:

Improve the Quality of Care and Increase Efficiency

There is widespread agreement that one of the causes of inefficiency in health care systems is fragmentation of the care delivery process and inadequate information transfer. Recognizing that effective sharing of medical information is essential for effective care, especially for older people and patients with chronic conditions, who are often followed by multiple physicians and have to move between different health care settings. Because of the centrality of information in health systems and the variety of uses that are made of them, ICTs, by enabling the various stakeholders to collect and exchange the necessary medical data in a timely and accurate manner, are able to promote better coordination of care and more efficient use of resources.

ICTs can also be extremely useful in improving some of the fundamental aspects of patient care safety: availability of individual medical information, electronic access to clinical guidelines or pharmaceutical databases, monitoring of effects of illness and treatments on the patient in time, detection and prevention of medication errors that may be harmful to patients. Indeed, the findings of this OECD study have been able to identify the impacts of integrating ICTs into the health sector in the following areas:

- ICTs would contribute, according to this study, to developing a "culture of safety" and to improving the acts and organization of the work of clinical staff

- Would facilitate drug combinations, and inform the decision with concrete, patient-centered, place-of-care information.

Most countries have also put in place special initiatives and programs to sensitize care providers to maximize the benefits that can be expected from the use of ICTs in terms of safety, including by encouraging record keeping of adverse effects.

Indeed, chronic disease is the biggest obstacle to the sustainability of many public health systems. Also the use of ICTs to improve care compliance with guidelines or protocols, particularly with regard to the management of chronic high prevalence conditions such as diabetes or heart failure, which are closely associated with preventable hospitalizations, allows for "quick wins". This has been the case in Canada, where the Province of British Columbia, by combining new care delivery strategies, the application of guidelines and the use of an "electronic toolbox" for the management of health care. chronic diseases, has significantly improved the management of diabetics, for a minimal cost and in a very short time. It was found that between 2002 and 2005, the first three years of the program, the proportion of people with diabetes who received care in accordance with the guidelines of the Canadian Diabetes Association more than doubled, while the average annual cost of diabetes care fell from CAD4,400 (CAD $) to CAD3,966 per patient.

Reduce the Cost of Delivering Clinical Services

ICTs can help reduce the cost of providing clinical services in three ways, namely by improving the way tasks are performed, speeding up data processing, and reducing the number of manipulations of documents. While evidence from other sectors shows that these functional improvements can have a positive effect on staff productivity, the data for the health sector are, in general, disparate and vary context and the technology used. Note that in the six case studies presented by the OECD, general practitioners observed an improvement in access to patient medical records, guidelines and drug lists, however, opinions are generally more ambivalent about effects of using electronic medical records (EMRs) or personal medical records (DMPs) on workload. Only Swedish doctors mentioned that electronic prescription saved them about thirty minutes a day, indicating that some components or functionalities of the DMPs are likely to have more favorable effects than others depending on the context. The results also show that the integration of these electronic patient management tools into clinical workflow is not always easy and that support and training services need to be provided in the early stages of implementation to optimize the support of service providers. Archiving and image transmission systems are more popular. They are considered essential for the establishment of fully functional DMPs and the provision of high quality remote care (telemedicine). It is recognized that these systems improve the processing time (or overall "throughput") of medical images and is a cost-effective electronic substitute for conventional image storage methods. This improvement of the flow rate goes

hand in hand with an acceleration of the rate and thus a reduction in the waiting time for both the tests and the results, which also makes it possible to shorten the time before the start of the treatment. Data collected from 22 sites in British Columbia indicate that reporting time has been reduced by 41% after the implementation of image archiving and transmission systems. This improvement is expected to increase capacity, improve the efficiency of health care, and thus the level of patient satisfaction.

Reduce Administrative Costs

Administrative processes associated with health care, such as billing, are an important source of savings. Among the case studies reviewed here, experts from Massachusetts (USA) found that the introduction of computerized claims processing as part of the New England Healthcare Electronic Data Interchange Network (NEHEN) consortium of providers and payers, established in 1997, had significantly reduced administrative costs. After the implementation of NEHEN, claims for reimbursement, which previously averaged USD 5 in paper form, were processed electronically at a cost of 25 cents per request. In 2006, the network processed over 4.5 million claims per month, or 80% of all Massachusetts claims. Through this intensive use, NEHEN has been able to significantly reduce the cumulative annual administrative costs of its members. Baystate Health, for example, saved more than $ 1.5 million in transaction costs between September 2006 and April 2009, less than three years. These savings are to a large extent due to the administrative simplification and the huge time savings from the manual processing of billing and claim information.

The Establishment of Completely New Modes of Care

ICT can also foster innovation and open up a wide range of possibilities for transforming the delivery process that can improve profitability. Evidence of the reality of these effects has accumulated over the past decade or so, so that ICT is also seen as transformative as it suggests the possibility of entirely new ways of delivering care. The case studies reviewed in this report show with concrete evidence that governments have mobilized this potential with three broad health reform goals:

- Modernize primary care that focuses on: improving chronic care, encouraging widespread general practice or multi-service delivery, and improving coordination of care
- Improving access to care: thanks to ICTs, and more specifically to telemedicine associated with image archiving and transmission systems, which are also widely used in rural and remote populations, there has been a marked reduction in impact of the shortage of doctors thus improving access to care.
- Improve the quality of care measurement and performance monitoring: ICTs are also used to improve health information systems. Electronic data

collection and processing provides data in an accessible form that facilitates the communication of different quality measures, or the comparison and identification of opportunities for improvement.

Conclusion

Today, information and communication technologies (ICTs) can be used for many applications in the health sector. They have made considerable progress and there is widespread agreement that they can contribute to improving the quality and safety of care and its adequacy to the needs of patients, while at the same time enhancing efficiency (more appropriate services, better availability and less waste). Proponents of the use of ICT in the health sector argue that it will help reduce the number of medication errors. However, in recent years, there has been an opportunity to realize, or even measure, the vaunted benefits and savings of ICT adoption in the health sector; is becoming more and more the object of debate in the world. The implementation of ICTs in the field of clinical care has indeed proved difficult, despite the prospects it suggests. Considerable public investment, notable successes, but also costly delays and failures, of which much has been said, are the results of over a decade of effort. In addition, it is very difficult to become more aware of the benefits of ICTs for keeping medical records and exchanging information.

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