Università
Ca'Foscari
Venezia

Corso di Dottorato di ricerca
in Management
ciclo 32°

Tesi di Ricerca

Digital Health Platforms: a Reflection on Unexpected Consequences and Patient Empowerment

SSD: SECS-P/08

Coordinatore del Dottorato
ch. prof. Francesco Zirpoli

Supervisore
ch. prof. Giovanni Vaia

Dottorando
Cristina Trocin
Matricola
829966

ACKNOWLEDGMENT

I would like to express my sincere gratitude to University Ca’ Foscari of Venice for giving me the opportunity to participate in the PhD Program in Management Department. This long and complex journey contributed to the person I am now and this has been possible with the support and assistance of several institutions.

I would like to thank the faculty of PhD in Management for their contribution and teaching approach to my path as a PhD student. The knowledge acquired during multiple classes in the first year allowed me to discover new perspectives and methodologies. This deeply transformed my personal attitude and way of thinking. I will always be grateful for the support received in difficult moments during such a challenging journey.

I would like to express my deepest gratitude to the Consortium Arsenal IT for providing the data, without which I would not be able to accomplish the PhD Program. During the data collection, I had the chance to meet professionals, who were working with passion every day to foster the digitalization in the care setting. I was fascinated by their working approach and devotion while taking care of multiple care actors. I am thankful for their time, support and suggestions received for this research project.

My special thanks to American University Kogod Business School for giving me the opportunity to be a visiting PhD student. I am grateful for the warm welcome received at my arrival, this was so important for me in that specific moment of my life. I am thankful for the professionality, infinite opportunities and dedication I experienced during my stay. Without your guidance I would not be able to participate to international conferences and understand the importance of doing research. During this experience, I understood the importance of conducting research and its impact on the society.

I am grateful to the reviewers for their time, suggestions and valuable feedbacks that allowed me to improve the PhD thesis. I am grateful to the scholars met at international research meetings, who encouraged me to further develop my research ideas and find my way.

I would like to express my sincere gratitude to my colleagues of the PhD program, without their support I would never be able to accomplish such a difficult path. I am thankful for their time, for being so close to me, for their patience, for their availability to always hear me and for cheering me up. Lastly, I would like to thank my close friends, who supported me during last years and who encouraged me to continue my path to discover myself.

TABLE OF CONTENTS

INTRODUCTION

The rise of digital platforms has transformed many industries such as hospitality (Airbnb, Booking), transportation (Uber, Lyft), healthcare (Health Information Exchanges, Electronic Health Records). They are used as new ways of organizing economic and social activities for delivering services over the last two decades. Organizations that used the affordances of digital platforms experienced a significant growth. Their increasing adoption has led to a growing interest in academic research (Kwark et al. 2017; Markus and Loebbecke 2013; Parker et al. 2017; deReuver et al, 2017). For example, Health Information Exchange platforms (HIEs) have been implemented in care organizations to improve the efficiency and the quality of care services by sharing medical information among care providers (Kohli and Tan, 2016).

Along with the digital platforms, a vast number of apps have been developed to address different aspects of disease management or prevention including screening, symptoms tracking, stress management, medical support, habit building and providing a routine to give patients more power and control over their healthcare path (Varshney, 2014). Prior scholars have attempted to understand the increasing use of mobile health applications and the way patients' role is changing by analyzing the adoption, the use and the consequences of mobile apps in the healthcare context, reviewing scientific literature, collecting empirical evidence of specific apps or conducting randomized controlled trials (Cerezo et al, 2016; Eskildsen et al., 2017; Klecun, 2016).

This thesis investigated consequences of digital platforms' and mobile applications' implementation, with a specific focus on unintended outcomes and on constant connectivity. Healthcare industry is a particularly suitable research setting since it involves multiple actors, who have often-conflicting interests, engaging in complex interactions. As a result, any change to the healthcare ecosystem is likely to produce unintended outcomes. Although prior research has generated valuable insights on digital health implementation from different actors' perspectives, less attention was devoted to investigating unintended consequences emerged from advanced technologies' implementation.

Electronic Health Records has the potential to decrease of care cost and improve care services' quality by combining clinical, financial, and operational data. There is a consensus that digitized healthcare information has not achieved its full potential yet. We argue that one of the important reasons for this shortcoming is our lack of understanding about unintended consequences. This thesis contributes to an ongoing debate regarding advanced technologies' implementation in care organizations. The thesis has a threefold aim, first it analyzes the most important unintended consequences in care organizations, then it identifies the impact of mobile health applications on patient empowerment and lastly it presents the lessons learned from an Italian Health Information Exchange Platform.

The thesis is composed of three research papers. The first paper highlights the potential of empowering patients through digital technologies with a specific case of mobile health applications. Its use and adoption continued to grow and became pervasive, an increasing number of studies investigated this phenomenon. Reduced information asymmetry has the potential to empower patients over their care path. However, information overload and lack of digital literacy may hinder patient empowerment. As a result, there is a lack of understanding of the impact of mobile health technology use on patient empowerment. This can lead to ineffective efforts in advancing mobile health research. A systematic literature review has been conducted to analyze the different definitions used to characterize patient empowerment and mobile health. We discuss the implications for all the care actors involved, uncover the emerging themes and present the opportunities and challenges of patient empowerment and mobile health.

The first paper provides several contributions to the literature of mobile health technology and empowerment. First, I provide a systematic review of studies engaged with the use of mobile technology and their consequences on different care actors and highlight the research gaps while providing the directions for future research. Second, I provide an analysis of a topic, which is at the intersection of the IS which mainly focuses on mobile health technology and Management, which is more interested in investigating the phenomenon of psychological empowerment. This is in contrast with previous literature review, which tends to focus on the technology use to uncover its impact, consequences on other actors and key characteristics within the same field. This study identifies the emerging research themes and its major gaps by research themes, theoretical lenses and units of analysis. Customized care services and timely monitoring has the potential to improve the quality of the care services and lower healthcare costs especially for patients. My purpose is that this research will lead to more research in identified research areas and to foster progress in this emerging research area.

Empowerment is a theoretical perspective especially important and valid in dynamic and complex settings as healthcare organizations as it fosters individual and collective behaviours directed towards the prioritization of the patient during the care path. In fact, positive participatory behaviours have been identified essential for improving patients' care services and quality of life. This study highlighted that empowerment is a process that is aiming to align patients' motivation with their care path while accomplishing tasks. The paper has provided strong evidence of a positive relationship between empowerment and positive benefits while using advanced technologies in care settings.

The second paper investigated the technology-driven unintended consequences in EHR implementation through the perspective of digital affordance. Any outcome, not initially planned in the Italian HER implementation, is considered an unintended consequence. This study used a grounded theory approach. 38 interviews have been collected, transcribed, analyzed and interpreted for a better understanding of the intended and unintended consequences. The analysis showed that digital platforms afford care actors to deliver intended consequences such as to connect multiple care settings, to provide rich and updated information for planning and remote monitoring, to provide continuous access to medical data and to improve the quality of care. However, if salient affordances and social forces are not anticipated, the system is likely to create multiple unintended consequences. Dysfunctional side effects cannot be entirely eliminated but if they are not minimized, they tend to outweigh the benefits of reached goals and lead to poor organizational change.

The implementation of an Electronic Healthcare Record platform in a dynamic and complex care setting often lead to a range of unintended consequences, which have profound effects on patients and care organizations. Any change aiming to improve a current situation will unavoidably have both intended and unintended consequences. Understanding which are the most important not expected outcomes of a project is crucial if care organizations are willing to improve the adoption rate of the technology implemented and to experience the expected benefits. The second paper has provided empirical evidence of the unintended consequences to avoid an overall result in backfires. It presents the way in which purposive goal oriented actions create unintended undesirable consequences.

The third paper presents an example of making a healthcare platform work in a northeastern Italian region. This study used 23 interviews from the 38 conducted for the prior study because the theme continuous connectivity emerged predominantly. Therefore, I continued the investigation in this direction and developed this paper. Through a qualitative analysis, it presents the benefits and lessons learned during the process of platformization and connectivity. I argue that the alignment of often-conflicting care actors' interests is crucial for sustainable efforts to increase connectivity among care actors.

Mobile applications afford technical connectivity that increase the communication possibilities between patients, caregivers and among caregivers. This constitutes a site where patients can continue their care path outside the care settings while communicating with caregivers. Patients can choose if, when, how and how much to connect with their physicians in relation to other social actors. During the data collection, I noticed that a continuous connectivity affect personal and health outcomes. Patients now have the potential to make connective choices, but the ways through which mobile connectivity brings benefits from massive communication possibilities is still blurred. This paper revealed how a northeastern Italian region managed the mobile connectivity and this case study provided insights about different care actors' behaviours, benefits and choices after the mobile technologies implementation though the metaphor of connective flow.

This thesis has implications for healthcare providers, policy makers and technology developers. Advanced technologies can support healthcare providers to better serve their patients by providing home care assistance and personnel training to reduce the need for hospitalization. Hospitals and post-acute care providers can enhance patients' capabilities for off-site monitoring and self-management. Regulations have yet to fully address the new challenges introduced by HIEs and mHealth. Policy makers are dealing with fragmented and complex regulatory environments. The authors believe that guaranteeing privacy and security in digital environments should have top priority. Another important issue is the communication among multiple care actors. Technology developers have led the way in digital health platforms and mHealth innovation, however, the ultimate value of these tools depends on interoperability and the connection with existing Health Information Exchange platforms.

Italian National Health System and the northeastern Italian region context

Information and Communication Technologies (ICT) have infinite affordances (material and digital at the same time) to materialize an integrated health ecosystem. Indeed, digital technologies can spread and release information among actors, increase the coordination and monitor the information flow. ICT has been enabling transformations in the healthcare domain. Some stakeholders are afraid of being substituted by digital technology or afraid of not being able to use the technology competently, while others are excited about the new possibility that digital technology can bring.

European Union is engaged with policies and initiatives that aim to provide top quality digital services in health domain. These policies and initiatives intend to empower citizens to build a healthier society and to offer citizen-centered health services. As evidenced by the Digital Agenda 2020 signed by European countries, digital health is a high priority in Europe. According to World Health Organization (WHO), digital health will make an important difference in controlling long-term costs, producing better health outcomes, empowering patients and care providers, while introducing new contributors to the health ecosystem.

European Union focuses on three priorities. The first one is to provide citizen secure access to personal health data across EU borders, the second refers to the implementation of personalized medicine through shared European data infrastructure while the third one focuses on increasing citizen empowerment to encourage people to take care of their health and to stimulate interactions between patients and care providers.

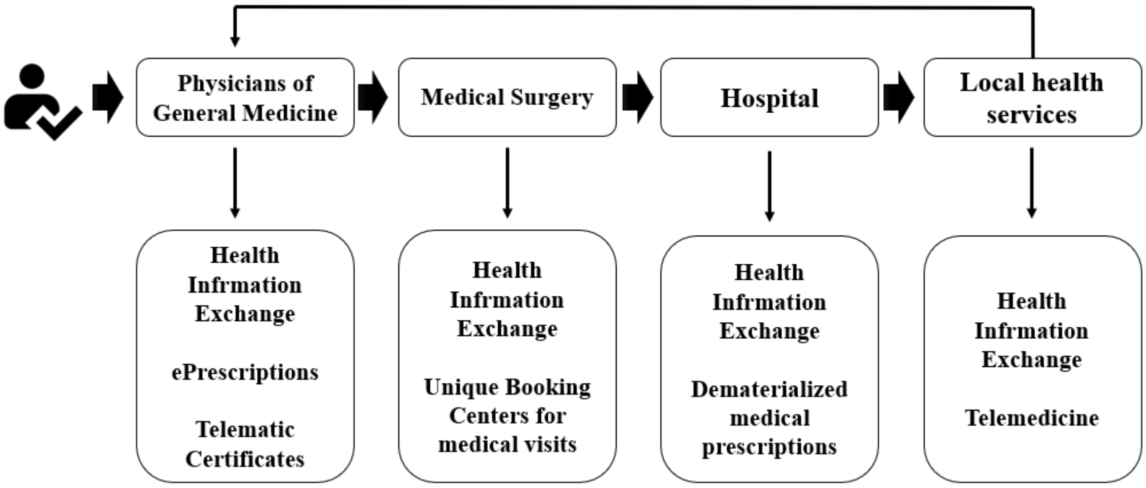
In 2008, Italy launched its first eHealth National Information Strategy. It was composed of five digital health services, including:

1. Telemedicine,
2. Health Information Exchange,
3. ePrescription,
4. Unique Booking Centers for medical visits
5. Telematic certificates.

The common goals for eHealth implementation are the harmonization of the digital solutions and the dematerialization of medical documentation. For example, the first Italian eHealth Information Strategy had the objective of ensuring a harmonious, coherent and sustainable development of information systems on the territory at national, regional and local level .

In the care path (Figure 1), the patient's first contact is the physician of General Medicine, who uses the HIE, ePrescription, and Telematic Certificates to register the entry of a patient into the health ecosystem, to address the possible care path, and/or to communicate with other actors of the ecosystem. The following phase is composed of the Outpatient Assistance that uses Unique Booking Centers and Health Information Exchange to track the next patients' path and book the first visits to specialized doctors. The Hospital Assistance comes in the third phase during which care providers adopt Health Information Exchange and the Dematerialized Medical Prescription. In the post-acute phase, a patient is treated by local services, which use Health Information Exchange and the Telemedicine.

Figure 1: Patient's care path with eHealth solutions



Source: Italian Ministry of Health Web site, http://www.salute.gov.it/portale/home.html

Patient's care path is supported by five digital tools that share his/her medical information among health actors. Health Information Exchange is the multisided platform potentially usable in all the phases of the care path. It has the ability to digitally collect, storage and provide medical information, thus it boosts the coordination among care actors through an increased connectivity of medical information.

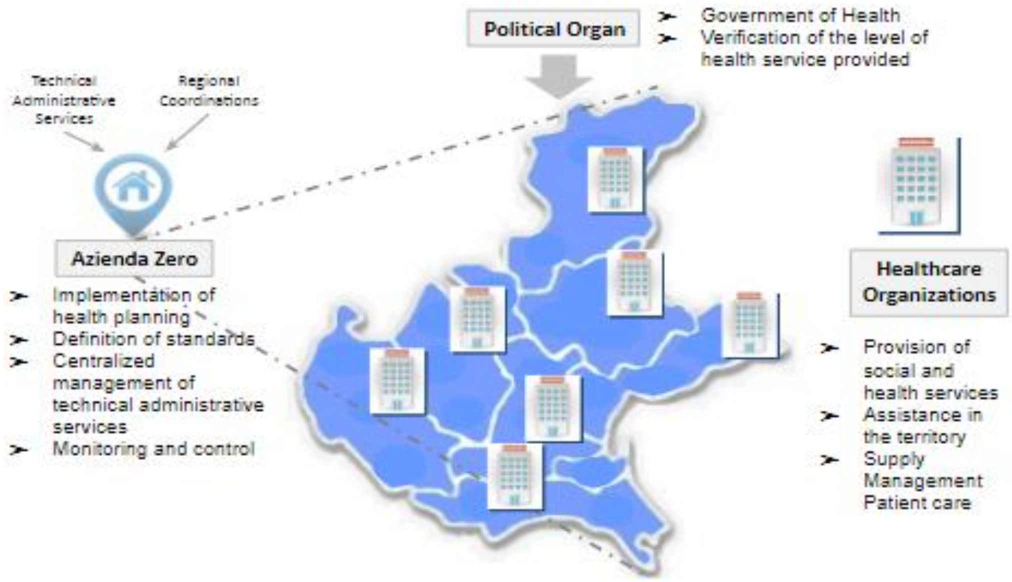
Organizational change of health in the northeastern Italian region

The introduction of digital technology in healthcare industry in the northeastern Italian region lead to new reorganization needs. Indeed, the region created new governance and organizational models, where the ICTs are the means to increase the quality of delivered care services and to maintain the care expenditure. In 2016 the number of care organizations has been halved. The current regional health system in the northeastern Italian region is composed of public Local Health Authorities, 2 Hospital Trust healthcare organizations, 1 Institute of Oncology and a holding institution (Figure 2). They are in charge of responding to the health demand of the region.

The new organizational asset has a holding setting established for the pursuit and achievement of the objectives of rationalization, integration and efficiency of the health, socio-health and technical-administrative services of the Regional Health System .

The new regional organization is similar to the connectivity of medical information, where the holding company plays the role of the Health Information Exchange platform that is integration of health services through an increased connectivity among care organizations, patients and political organ.

Figure 2: New organizational model of northeastern Italian Health System



Source: northeastern Italian region

The Consortium

The region rush towards digitalization took place with the support of regional public institutions and a consortium. It is the Research Centre for eHealth Innovation in the region and has a transversal role for the region’s care system. It governs the ICT systems accompanying the care organizations towards the digitalization of people, processes and the entire ecosystem. The Consortium offers a common ground for the experimentation and the testing phase before the implementation of new platforms, devices, innovative organizational models in care organizations.

In 2007, the consortium was created for spreading the concept of eHealth in the region. One of the first issues that the consortium tackled was the lack of interoperability of standards among different digital solutions across regional care organizations to solve the mosaic problem: multiple, independent and incompatible digital tools in different departments. Several standalone solutions had been created for eHealth programs in northeastern Italian region, which were not able to communicate among each other.

Today, the consortium is engaged every day with managing the creation of digital infrastructures and the implementation of organizational and technological platforms in the region healthcare ecosystem. Its bold mission is to improve the health processes towards an inter-company collaboration with a three-fold aim: optimizing resources, containing costs and facilitating the management of change.

Empowering Patients through Digital Technologies: The Case of Mobile Health Applications

Cristina Trocin[1] and Enrica Croda[2]

Abstract

Mobile health initiatives aim to give patients more medical information and to empower them over their medical treatments. However, information overload and lack of digital literacy may hinder patient empowerment. This article investigates opportunities and challenges of patient empowerment and mobile health. The authors analyze the different definitions used in the literature to characterize patient empowerment and mobile health, discussing implications for all the care actors involved. Although the adoption rate of mobile technologies is at its infant stage and challenges still outweigh the benefits of patient empowerment, mobile health apps can foster the progress towards patient-centered care.

Keywords: *mobile health, healthcare service delivery, digital healthcare, care prevention, mobile technology, mHealth*

Published book chapter

Trocin, C., & Croda, E. (2020). Empowering Patients Through Digital Technologies: The Case of Mobile Health Applications. In *Impacts of Information Technology on Patient Care and Empowerment* (pp. 34-57). IGI Global.

---

[1] Corresponding author, Department of Management, Ca' Foscari University of Venice, Italy

[2] Department of Economics, Ca' Foscari University of Venice, Italy

INTRODUCTION

The introduction and worldwide adoption of new information technologies are changing healthcare around the globe. A powerful combination of factors is driving this change. These include rapid advances in mobile technologies and applications, cloud-based computing and the exponential growth in coverage of mobile cellular networks (Dadgar & Joshi, 2018; Fox & Connolly, 2018; WHO, 2011).

In recent years, especially since the advent of smartphones, a vast number of apps have been developed to address different aspects of disease management or prevention including screening, symptoms tracking, stress management, medical support, habit building and providing a routine to give patients more power and control over their healthcare path (Varshney, 2014). There were more than 325,000 mobile health applications available in major apps stores and over 3.5 billions downloads in 2017 alone, reflecting a growth rate of 16% compared to the previous year (Research2Guidance, 2018). Researchers have attempted to understand the increasing use of mobile health applications and the way patients' role is changing by analyzing the adoption, the use and the consequences of mobile apps in the healthcare context, reviewing scientific literature, collecting empirical evidence of specific apps or conducting randomized controlled trials (Cerezo et al, 2016; Eskildsen et al., 2017; Klecun, 2016).

The pervasiveness of mobile apps in the healthcare industry suggests that their use has enriched doctor-patient communications and improved the delivery of care services (Boonstra & Broekhuis, 2010). The focus of care providers is shifting from productivity to quality of care and to positive experience for patients. This can be reached through timely health advice (Perera et al 2011), promotion of compliance and adherence to medical treatments (Free et al., 2013), staying connected with health care provider(s), personal health management (Chatterjee et al., 2018; Dadgar & Joshi, 2018), self-care (Storni, 2014), and remote consultation (Manda & Herstad, 2015). Consequently, mobile health is composed of advanced technological tools with several benefits such as portable access to continuous streams of information, interactive functionality of the apps, monitoring patients remotely, and sending electronic alerts for disease control (Klasnja & Pratt, 2012).

An increased availability and accessibility of medical data on mobile applications foster in patients the feeling of having control on their care path. Thanks to digital devices the patients can perform multiple tasks in an independent way and out of care settings. They have the tools to download the reports of their medical visits online, to store them on their computers, to consult their pharmaceutical dossier anytime, or to request pharmaceutical prescriptions online. The active involvement of the patients derives from an increased awareness of the required tasks. When patients perform them with the support of digital devices, they acquire more autonomy and control over their immediate activities. With the time patients acquire more confidence and view how their behaviour make the difference on their health conditions or how this improved the quality of their life although a chronic disease. Digital devices have the potential to foster the feeling of self-efficacy in patients, which has been defined as a psychological empowerment.

Although the proliferation of mobile devices is continuously increasing because of reduced costs and diminished waiting times (Reychav et al, 2018), this phenomenon has not reached maturity yet. Some patients have had a positive experience using mobile apps to manage chronic diseases, while others have had a negative feedback because they became more dependent on care professionals, thus losing some of the advantages of patient empowerment. For instance, Ghosh and colleagues (2014) demonstrated how digital integration enhanced patients' psychological empowerment to manage a chronic disease.

Patients may benefit from using mobile apps as they acquire higher awareness of their care path or they are being facilitated in accomplishing routine tasks (Prgomet et al, 2009; Noteboom & Al-Ramahi, 2018; Marcolino et al, 2018). In contrast, others face several challenges with mobile apps because of the potential information overload due to cognitive constraints (Iyengar & Lepper, 2000) and the lack of expertise or digital literacy (van den Broek & Sergeeeva, 2018; Fox & Connolly, 2018). Additionally, a recent study demonstrated that patient empowerment is an elusive ideal and on the contrary patients become more dependent on care professionals (van den Broek & Sergeeva, 2018).

The terms *patient empowerment* and *mobile health* have been used for a number of years, during which patients and medical staff have interpreted their meanings in different and sometimes contrasting ways. The absence of consensus over the definitions has led to misunderstandings among healthcare practitioners, researchers, policy makers and stakeholders alike. To make progress, it is crucial to take stock of existing knowledge.

This article investigates opportunities and challenges of patient empowerment and mobile health, and discusses implications for care actors. After presenting the research methods, the authors review definitions of patient empowerment and mobile health. For each of these dimensions of “mobile health revolution”, they examine the main benefits and challenges experienced by care actors. Finally, they conclude with the discussion of the implications mobile health technologies for different stakeholders and directions for future research.

METHODS

The authors followed a systematic literature review for selecting and extracting data from the research papers, which is widely accepted and adopted in IS and Management fields (Parè et al, 2015; Leidner, 2018). This approach is particularly valued for its key characteristics such as transparency, replicability and rigour (Bandara et al, 2015; Boell and Cecez-Kecmanovic, 2016; Pare et al, 2016; Templier and Pare, 2017). Boel and Cecez-Kecmanovic (2016) suggested guidelines to review prior studies, which have been applied for this study.

The aim of our paper is to investigate opportunities and challenges of patient empowerment and mobile health in the existing literature to produce meaningful results. To this purpose, the key terms such as mobile health technology and psychological empowerment constitute a clearly delimited topic. Additionally, the terms allow to identify a complete set of relevant documents from selected databases to provide a good coverage of relevant literature in IS and Management. However, the protocol was open to include or exclude additional terms or concepts as it is an iterative research process.

Boell and Cecez-Kecmanovic (2016) provided guidelines for conducting systematic literature review. This study follows this approach and I present the step-by-step process followed for creating the protocol, searching the literature, selecting papers, coding process and themes classification.

Development of Protocol

The protocol guided the data collection and analysis for the review. It is composed of five subsections, namely research questions, sources searched, search terms, search strategy, inclusion and exclusion criteria.

The *first* step requires to specify the purpose of the review and to road the map towards its answer (Templier and Parè, 2018). The research questions have been identified previously as this is one paper of a broader study, which investigates the adoption and impact of digital technologies in the context of the healthcare industry. Mobile health represents a typology of digital technologies adopted in the care context for data creation, visualization and for exchanging medical information. Psychological empowerment in patients is considered a key element for improving the quality of care and for increasing the reach of the care services.

In the *second* step, the authors identified the pool of journals, conferences and databases. The primary source of publications is composed of the Association for Information Systems ‘‘basket of eight” IS journals retrieved from the AIS website www.aisnet.org. and leading management journals such as Academy of Management Journal, Academy of Management Review, Administrative Science Quarterly, Business Ethics Quarterly, Journal of Applied Psychology, Journal of Management, Strategic Management Journal, Organization Science, Information and Organization, Journal of Management Studies, Information and Management. To include recent studies that have not yet been published, the proceedings of three leading conferences such as ICIS, AMCIS and ECIS were added. For a comprehensive synthesis of the topic, the searching process was also conducted within main online academic databases such as EBSCOhost Business, Searching Interface, Web of Science, Scopus, ACM Digital Library. The maximum coverage of the topic was achieved with “all databases” option in EBSCO and WOS. Specifically, on Web of Science I searched on ‘‘Topic” for the journals and the AIS electronic library and on ‘‘Title”, ‘‘Abstract”, and ‘‘Subject” for the conferences. The authors searched articles published between 1980 and December 2018.

Insert Figure 1 - Selection of Research Sources by Field

Third, the authors searched two key terms, mobile health technology and psychological empowerment, in the topic, title, abstract, or subject. The authors used additional keywords to ensure the coverage of potentially relevant search results such as mhealth, health applications, mobile healthcare, patient empowerment. The search terms were used with the Boolean “or” operator to ensure that papers that contain these keywords were extracted. Data extraction form in Appendix 1 has been used to extract the data from the selected research papers.

The *fourth* step requires to define the search strategy. The authors proceeded with scoping search for initial screening of existing reviews. Then, they searched in selected databases while adding the modifications during the search and bibliography search to identify key citations for searching further papers through backward and forward reference searching (Figure 2). With regard to the identification of literature reviews, they searched for publications in top-tier IS and Management journals. The authors followed a manual procedure to identify review candidates because some information systems journals do not indicate explicitly that a specific article is a literature review. For avoiding to miss some literature reviews, they searched in academic databases, conference proceedings and journals to increase the comprehensiveness and the coverage of the literature reviews published in IS and Management journals. The search process accumulated a total number of 126 research papers.

Insert Figure 2 - Selection of Research Papers

It the *fifth* step, the authors defined inclusion and exclusion criteria. First of all, they opted to include papers published in English language that used any methodological approach. Peer reviewed academic journals and complete conference papers are preferred for this analysis. Instead, they excluded research in progress, abstracts, workshop proposals, book chapters, demos and blogs because they are in the exploration phase of the phenomenon. The reason of these restrictions was to exercise quality control on the selected papers. Peer reviewed papers impose strict requirements, which augment the quality control. The selection process involved two rounds. In the first phase, they filtered papers from sources searched based on title, keywords and abstracts and the authors excluded those papers that were not related to the two key words. In the second round, the authors checked whether the terms have been used in the body of the article.

After having selected the papers according to this strategy, the authors identified the definitions of patient empowerment and mobile health and proceeded to analyze the main benefits and challenges faced patients while using mobile health technology.

DISCUSSION

Psychological Empowerment in Patients

The spread of digital health technology brings about a fundamental change in patient information flow. Traditionally, there used to be a unidirectional flow of information from health professional to patient. The mobile health apps are now turning this communication into a dialogue, which may involve information flowing back from patient to health professional, or may manifest as communication between patients themselves. Mobile health also allows patients to obtain information about their conditions that was previously accessible only by health professionals. These changes have the potential to empower patients.

Definitions and factors of patient empowerment[3]

The concept of empowerment is not new and has been used and investigated in different contexts and domains (Maynard et al, 2012). The interest in this topic has continued to increase in management and organizational fields because the practice of empowerment is considered a principal component of organizational effectiveness (Conger & Kanungo, 1988). This section analyzes the concept of empowerment through its historical evolution (Table 2).

Three seminal studies introduced the concept of empowerment and how to operationalize it (Conger & Kanungo, 1988; Spreitzer, 1995; Thomas & Velthouse, 1990). Conger and Kanungo (1988) considered empowerment as a *motivational construct* because when individuals perceive themselves to have control and cope with social life events, they believe they adequately can confront with other people. They consider empowerment as an *enabling process* rather than a delegating one because it increases the motivation of subordinates to accomplish several tasks while highlighting personal efficacy.

Thomas and Velthouse (1990) further developed this concept. They proposed a cognitive model of empowerment and operationalized it in terms of *intrinsic task motivation*. They referred to those experiences that individuals gather and value as positive for accomplishing specific tasks. They added three more notions more notions: *impact, choice* and *meaning.*

Spreitzer (1995) built on these previous studies and coined the term *psychological empowerment* with the related cognitive dimensions, arguing that psychological empowerment is a *multifaceted motivational* construct composed of four cognitions that provide an energetic role to the employee.

The concept of empowerment implies three underlying assumptions. First, psychological empowerment may take different forms in different people because the population can be

---

[3] It is important to notice that the concept of patient empowerment is similar but it is not interchangeable with the concept of patient engagement. Empowerment represents the process by which patients gain control over their care path and feel that they can adequately cope with events and situations. The feel of empowerment leads the patient to better accomplish the required tasks. Engagement is the act of health providers and patients working together to contribute to improved health conditions. This includes better education, better motivation, creating a better healthcare experience, and driving better and shared decision-making (Peleg et al, 2018).

differentiated in multiple ways based on age, job position, education and different characteristics of the target population (Zimmerman, 1995). Second, psychological empowerment might take different forms in different contexts across different life domains, which might require different skills, knowledge, competences in order to have an active role inside a particular organization. Third, psychological empowerment is a variable construct that might change over time because an individual initially might experience the feeling of empowerment and later disempowerment or vice versa. Moreover, they might become empowered over time. Zimmerman argues that a universal measure of empowerment for all cases is not a realistic option and not appropriate (Zimmerman, 1995).

Starting from the core definitions and operationalization of the concept of psychological empowerment, multiple research projects have further developed and contextualized it according to specific case study, or field or situation. Initially, it has been studied in organizational and management domains with a focus on the ways to increase the motivation of employees to better perform their tasks and achieve better results. Later on, the term psychological empowerment spread among different settings such as education, innovation, healthcare, strategy, and crowdsourcing. Table 1 provides a summary of the most recognized definitions of patient empowerment in the healthcare industry (Bulsara et al, 2006; Deng et al, 2016; Maynard et al., 2012).

Insert Table 1 – Definitions of patient empowerment

Based on the analysis of the definitions, the authors identified four crucial factors that better describe the concept of patient empowerment (see Table 2). It has been defined as an enabling and transformative process of promoting and enhancing people’s ability to meet own preferences and to mobilize resources for gaining control over their healthcare to better comply and adhere to the medical treatment (McAllister et al, 2012). Some researchers have listed patients’ abilities required to possess or to develop empowerment (Permwonguswa et al, 2017). Others conceived it as a process, which involves patients, medical staff, and family members (Anderson & Funnell, 2010; Castro et al., 2016; Khuntia et al, 2017; Zimmerman, 1995); or, it has been considered an outcome to be achieved for increasing healthcare quality (Wentzer & Bygholm, 2013).

Insert Table 2 – Key factors of patient empowerment

The process of patient empowerment can be analyzed from the caregivers-patient's perspective and from the patients' viewpoint alone (Aujoulat et al, 2007). If we take into account the caregiver-patient interaction, it is considered a communicative process through a collaborative and fair relationship, where values and decisions are shared (Galanakis et al, 2016; Singh et al, 2011). Instead, if the definition is considered only from the patients' points of view, the process of empowerment is considered a process of change from a passive towards an active role (Table 2). Additionally, patient empowerment has been defined as a capacity-building process, in which patients play an active role in decision making and their health management process (Khuntia et al., 2017). For instance, Khuntia believes it goes beyond care management and focuses on enhancing care-provider and patient relationships.

Patient empowerment[4] has been conceived also as an outcome related to medical treatments, which can be reached through self-management (Funnell et al, 1991), self-efficacy (Galanakis et al., 2016), self-determination (see Appendix 1; Aujoulat et al., 2007), self-esteem (Rogers et al, 1997), or active participation in decision making (Small et al, 2013). Self-efficacy is one of the most used concepts in the definitions (see Appendix 1). It is considered at the individual level referring to personal levels of performance in disease and treatment behaviors.

Some definitions focus on common goals such as: patients who are empowered are healthier; will take more rational decisions; will contribute to more cost-effective healthcare resources; and, will receive higher care quality services (Holmström & Röing, 2010; McAllister et al., 2012). Others refer to patients' quality of life during medical treatments or in the follow up phase. This includes capabilities to cope with negative feelings, and personal satisfaction. Other authors focus on capabilities and actions to be taken to empower patients through education, patient-centered care, or active participation in design phase (Holmström & Röing, 2010).

Benefits and challenges of patient empowerment

Psychological empowerment is a complex process that has been investigated at micro (patients, medical staff), meso (healthcare organizations or entities) and macro levels (healthcare

---

[4] For examples of successful implementation of this concepts and the way key factors of patient empowerment see Klasnja and Pratt (2012); Wiljer et al (2008); Reychav et al (2019).

industry) (Castro et al., 2016). Previous empirical studies investigated the benefits and challenges of those patients who feel empowered.

Prior studies investigated the consequences of patient empowerment with relation to a specific target population, which includes mental health (Rogers et al., 1997), long term conditions in primary care (Small et al., 2013), HIV patients (Johnson et al., 2012; Webb et al, 2001; Wilson et al., 2018), patients with chronic diseases (Maunsell et al., 2014; Galanakis et al, 2016), and patients with cancer (Bulsara & Styles, 2013).

The main benefits experienced by empowered patients consist of emotional empowerment, autonomy, self-efficacy and feeling connected.

Emotional empowerment: The process of giving power to patients over their medical treatment means to give more decisional, cognitive, emotional control, and hope to improve personal quality of life (Doll & Deng, 2010; Huang & Ran, 2014; Wilson et al., 2018). This enables patients not only to better understand their care path but also to take actions and to have an impact on their own path (Anders & Cassidy, 2014; Aujoulat et al., 2007; Loukanova et al, 2007).

Autonomy: Complete and updated medical information allows patients to acknowledge the areas of their life more affected by their illness (see Appendix 1). Then they can autonomously determine the best and most suitable decisions and tasks to have meaningful outcomes in their life (Aujoulat et al., 2007). The medical treatment changes patients' habits and routines, which consequently might decrease self-confidence and the ability to make decisions in an autonomous way. Mobile technologies facilitate patients' routines and medical treatments, for managing medical prescriptions or for other administrative purposes and to give the opportunity to patients to complete tasks and procedures in an autonomous way (Holmström & Röing, 2010).

Self-efficacy: Empowered patients are defined as those individuals that are aware of their health conditions and have the capacity to make decisions about their health, and to take control over their life in order to reach their goals related to health conditions (see Appendix 1). This means to make more rational decisions, to decrease their dependence on health services and achieve the desired outcome (McAllister et al., 2012). The concept of self-efficacy is the most used and studied measure related to the concept of empowerment (Reychav et al., 2019).

Feeling connected: During the medical treatment, patients might face hard times and might be in need of support not only from family members but also from external actors. This refers to medical staff while monitoring patients' health with the help of mobile technologies but also refers to other patients with the same pathology. One antecedent of feeling empowered is to feel connected with the rest of the society, including family, friends, colleagues and other people in their same condition (Bravo et al., 2015).

The approach of patient empowerment is not entirely shared and supported by practitioners mostly because it imposes additional elements on their time and efforts since it challenges physicians' autonomy.

Time and effort: Medical information is created and managed by care professionals, who can benefit from shared data if they implement it. Therefore, they are required to change the results of medical visits on the platform and send it to mobile apps. This requires a higher involvement and effort, considering the time required to create digital versions of medical data and then transmit it further (Sandlund et al, 2016; Miller et al, 2016). Higher investments are needed in terms of time and effort to learn the platforms, and explain the information to patients. This might be frustrating and time consuming, especially in the initial stage of implementation. In fact, one of the key barriers to mobile technologies adoption is the creation of accounts, and legal authorization of data sharing (Dadgar & Joshi, 2018)

Physicians' authority is challenged: Not only does the decreased information asymmetry between patients and physicians yields more opportunities for empowerment, it also challenges the role of physician authority and expertise. Indeed, more information increases patients' awareness regarding medical treatments, but, at the same time, patients have the opportunity to question physicians' knowledge and suggestions. This happens especially in those situations, when patients are not able to contextualize medical information and might be willing to choose a past treatment for a new disease based on positive outcomes or vice versa.

Implications for care givers and care receivers

The patient empowerment approach involves shared decision making, which can increase existing knowledge, provide more accurate risk perceptions, make the decisions in line with patients' preferences, reduce internal decisional conflict for patients, and diminish passive or undecided patients. It also creates the opportunity to address the problem of over-diagnosis and overtreatment. When patients know that they have several options available for the best treatment such as a screening test or diagnostic procedure, they are more willing to engage with the clinicians in the decision making process (Liberati et al., 2015).

The creation of an ecosystem offering digital healthcare services focused on the collaboration and participation of healthcare professionals leveraging on their expertise, on the co-creation of ideas and on the co-design service directly involving the end-users. The contribution of the patients represents the keystone to create useful and usable services for everyday healthcare activities and at the same time ends up with enriching the construction of the healthcare digital ecosystem.

The innovativeness of mobile applications lays in the integration of different needs of all involved categories/stakeholders in an open space for dialogue, listening, co-creating and negotiating proposals for common, innovative solutions. The key concept of the mobile application is to offer a tailored service for digital health that directly and predominantly involves the patient (patient-centered-healthcare-ecosystem). It offers the possibility to access a dematerialized medical prescription, to manage personal medical information, monitor the process of personal continuous healthcare, be aware of the healthcare process, understand how the healthcare system works (transparency), and be responsible for the personal medical data management (patient empowerment and awareness).

Generation, storage and processing of data is the lifeblood of digital disruption and represents an opportunity for many industries including healthcare, which by definition is a knowledge-intensive and information-intensive industry. Information and Communication Technologies (ICT) shape both the execution of company activities and the organization of information flows and services. More specifically, ICT allows the exploitation of different advantages such as intra and inter-organizational distribution of limited resources with a patient-centered perspective, monitoring the company's performance, facilitating the interactions between the many actors involved, and optimizing internal processes to offer a more efficient service of higher quality. Significant challenges remain, and many new approaches and ideas are needed to ensure potential benefits materialize within healthcare organizations. In the meanwhile, investment in this area continues (Atasoy et al, 2017).

Mobile Health

Mobile applications in the healthcare sector share common goals. For example, they have the potential to increase the quality of the care services through shared medical information (Reychav et al, 2018), to increase healthcare efficiency and efficacy while increasing patients' satisfaction (Varshney, 2014), to facilitate the care service delivery, to offer patients tailored services, and to provide more convenient access to needed health information (Rai et al., 2013).

The development of mobile care apps follows a multidimensional and multidisciplinary approach that takes into consideration technical aspects as well as their effects on the final users. The goal is twofold: fostering an active engagement of the final users in the process and empowering the users while satisfying real needs as a cornerstone of the process of innovation.

There is a tendency to create a medical app in response to a specific need, fostering the concept of tailored care service and creating a user-driven innovation to represent value and impactful delivery of care services. So far, mobile device projects have been implemented on a pilot basis with a collaborative and participatory approach of healthcare professionals leveraging their expertise, on the co-creation of ideas and on the co-design of service directly involving the end-users (Marcolino et al, 2018; Yaraghi et al, 2014).

The pervasiveness of mobile health apps has been encouraged by policy makers, who have emphasized the fact that the patients' voice can gain control over factors that might affect their health and lives through the use of mobile technologies (Castro et al., 2016; WHO, 2011; WHO, 2016).

Definitions and key characteristics of mobile health

Over the last two decades this term has been used in many fields from health sciences to computers and human behavior, information systems, and information management. However, to date, no standardized definition of mHealth has been established. The authors selected nineteen different definitions reported in Table 3.

Insert Table 3 here – Definitions of mobile health

Some scholars have embraced a technical view. For example, Zhao and colleagues (2018) defined mobile health services as tools for *"providing health services and information through the use of mobile communication technology, such as smart phones, 3G/4G mobile networks and satellite communications".* Studies adopting this view, have highlighted mobile technologies' technical functions such as networking capabilities, convenient access to medical information, cloud-based computing systems, medical sensors, and satellite communications (Liu et al, 2018; Meng et al, 2018; Wu et al, 2007; Yen et al., 2011).

Other scholars have conceptualized mobile health apps based on non-technical perspectives by focusing on their consequences and on the interactions and information exchange among different groups. Specifically these scholars have studied health promotion, prevention, chronic disease care enhancement, saved time and cost of diagnosis, enhanced therapeutic relationships, improved access to healthcare services and low cost affordable solutions (Eng et al, 2013; Hoque & Sorwar, 2017; Pung et al, 2018). Some of them have also investigated information and timely interventions, and effective communication between the care providers and receivers (Rai et al, 2013).

Certain characteristics of mobile health apps are common to all the definitions reported in the Table 3. For example, most researchers argue that mobile health apps have the potential to facilitate the delivery of care services, to improve the quality of the care, to share timely medical information, to meet patients' needs with pervasive access to medical information and to improve patient-physician' interactions. Moreover, scholars have highlighted that shared medical information facilitates remote monitoring of patients, delivering care, reducing costs, saving time, and increasing accessibility and geographical coverage of services (Reychav et al., 2019).

The uptake of mobile apps is rapidly increasing thanks to their core characteristics, which are the following:

- Mobility provides an access to medical information without physical and temporal constraints (Prgomet et al., 2009).
- Ubiquity, a consequence of mobility, provides a direct access to multiple information anytime and anywhere (Middleton et al., 2014).
- Connectivity allows the exchange of medical information among multiple actors not only in the healthcare system but also with the personal network of the patient like family, friends, other patients with similar diseases regardless time and location (Dadgar & Joshi, 2018).
- Transparency and accuracy are achieved via information storage, analysis and consultation (Dadgar & Joshi, 2018). Some information may be retrieved from previous medical visits or laboratory results thus avoiding the duplication tests (Adjerid et al, 2018).
- Coping with perpetual tasks increases patients' autonomy because once the medical treatment has been selected, mobile technologies allow patients to better adhere to the medical treatment (Dadgar & Joshi, 2018).

Benefits and challenges of mobile health

Recent studies have demonstrated that mobile health applications have the potential to improve the quality of the care services through shared medical information (Reychav et al, 2018), to increase healthcare efficiency and efficacy while increasing patients' satisfaction (Varshney, 2014), to facilitate care service delivery, to offer patients tailored services and to provide more convenient access to needed health information (Rai et al, 2013; Klasnia & Pratt, 2012). Therefore, the authors analyze benefits and challenges that care actors experience using mobile health applications to accomplish daily tasks. The main benefits range from enhanced care quality, to the removal of geographic barriers, to the facilitation of access to customized information, to the remote monitoring of patients.

Enhancing care quality: Policy makers are shifting their attention about care performance from productivity to positive patients' experience based on their preferences. The World Health Organization[5] defines the quality of care as "*the extent to which health care services provided to individuals and patient populations improve desired health outcomes. In order to achieve this, health care must be safe, effective, timely, efficient, equitable and people-centered.".* The return of desired health outcomes refers to the best available medical treatment in line with patients' preferences and values. The underlying assumption is that the care service that meets patients' needs and health conditions enhances the care quality. According to this approach, the focus of care organizations shifts from care professional controlled care to professional managed care, creating the concept of patient-centered care service (Varshney, 2014; Peleg et al, 2017).

Removing geographic barriers to health information or geographical coverage of services: Mobile health apps facilitate patient-care professional interactions which can take place from different locations (Varshney, 2014). Temporal and locational constraints can be removed as the diagnosis sent by the primary care physician to the patient can be consulted in different moments by the patient and also by other physicians. This is particularly useful for routine activities (i.e. chronic disease, medical prescriptions), emergency cases and during holidays in different locations. In fact, a patient suffering from chronic disease during the holidays has the opportunity to get the prescribed medicine in any pharmacy around the vacation location. Moreover, in emergency cases, patients can remotely access their medical history thanks to Health Information Exchange platforms or Electronic Health Records (Peleg et al, 2017; Peleg

---

[5] The definition can be retried from the following link https://www.who.int/maternal_child_adolescent/topics/quality-of-care/definition/en/

et al, 2018). Therefore, mobile health applications have the potential to remove the time and location constraints under the condition that digital platforms and mobile technologies are implemented in all care organizations and have interoperable systems, which requires economic, time and effort investments (Trocin et al., 2018).

Facilitating access to customized information: Mobile health apps are considered extensions of digital care services for providing timely patient-tailored care. The access to a complete medical information may make the difference for the diagnosis of a disease, the management of chronic disease and for handling an emergency case. For example, Health Information Exchanges facilitate the sharing of medical information and their access by multiple care actors such as general and specialized physicians, nurses, and administrative staff for different purposes, based on their account characteristics (Peleg et al, 2018). Moreover, mobile technologies further facilitate access to information which can be updated and customized based on care path and the reaction of the patient to the specific medical treatment (Reychav et al., 2018).

Facilitating decision making: One of the major goals of mHealth is to facilitate decision making (Nouri et al, 2018). Access to recent medical information can improve the quality of the decisions and decrease duplicated tests, which leads to efficiency improvements (Ayabakan et al, 2017). Mobile systems can reduce task completion time significantly. Healthcare professionals consider multiple sources of information before the diagnosis such as symptoms, medical history, lab results and tests (Peleg et al, 2017). This information is shared with the patient and the decision making process moves forward in collaboration with the patient. Multiple care actors are involved in the decision making process, thus mobile technologies facilitate processing and updating pertinent medical information. This is particularly useful for patients simultaneously affected by multimorbidity, which can be facilitated by mobile health technology (Peleg et al, 2018).

Remote monitoring of patients: Mobile health applications provide opportunities to deliver care services beyond the physicians’ offices and hospital setting thus reshaping the boundaries of care organizations and care services (Singh et al, 2011). For instance, in the past, patients were released from a hospital during working days and the medicine prescribed during traditional working hours. Nowadays, patients can be released and buy the necessary medicine without temporal constraints. In case of necessity, physicians can prescribe additional medicine through the mobile app and patients can get them from pharmacies. For chronic diseases, patients can self-monitor their health status with the mobile apps and their physicians can check them through the apps (Reychav et al., 2018).

Example of apps that have been used for the remote monitoring of patients are personal weight management apps. Kwon and colleagues (2017) studied the efficacy of such an app. They followed a Markov modeling approach to capture the intrinsic motivation, or state of self-regulation, of individuals engaged in losing weight. They demonstrated that use of the mobile app is more effective than the PC to influence the behavior of the patients. An intensive use of the mobile application increases the probability of losing weight but after a threshold of 80% of the time engaged in this activity.

Beyond the aforementioned benefits, mobile health applications also raise challenges that might inhibit their adoption. The major challenges arise from privacy concerns, digital divide and digital health literacy.

<u>Privacy concerns:</u> The act of sharing medical information among multiple care actors on digital platforms and mobile apps requires legal authorization from patients, which involves a sequence of steps and might be considered a barrier to adopt mobile technologies. Account creation, collection of medical information from previous visits and later update requires higher involvement and effort from all care actors (Sandlund et al, 2016). Moreover, legislation on the ownership of medical data and on the extent to which it can be shared is not clearly defined. The boundaries of dealing with medical information on digital platforms and on mobile technologies are blurred, thus patients might not feel protected enough and might not want to use these tools. Health data privacy concerns are considered barriers to mHealth adoption (Fox & Connolly, 2018, McKinsey, 2013). For example, reminders on patients' mobile devices help patients to do regularly specific tasks and improve medical adherence. They have the potential to increase motivation and the probability of being effective during the care path (Klasnja and Pratt, 2012). In case someone can see the recipients' phone, patients need a privacy-preserving also in the reminder option of mobile apps. Otherwise, they will not use them and the potential for increased medical adherence will not be realized (Jean et al, 2018; Wu et al., 2007).

<u>Digital divide:</u> The pervasiveness of mobile health apps facilitates access to medical information but also leads to a digital divide (Fox and Connolly, 2018; Kenny and Connolly, 2017). The digital divide is stronger along the age dimension. Older patients are those who could benefit from mobile technologies for chronic diseases such as diabetes, which increase with age. However, research shows that, rather than using apps to manage chronic health conditions, they prefer to use apps for fitness and dieting. They are concerned about privacy and lack trust and do not want to disclose personal data. Recently, some scholars found that older patients tend to avoid mobile health apps (Fox & Connolly, 2018; Srivastava et al., 2015).

The digital divide arises when some needs are ignored or not satisfied. As a consequence, some patients remain excluded from the potential advantages of mobile health (Kenny & Connolly, 2017).

Digital and health literacy: Platforms and mobile apps collect and generate an increasing amount of medical information. On one side, this enriches patients' medical history and allows a more accurate diagnosis (Bravo et al., 2015). On the other side, this might create confusion for patients, who might lack digital skills and health literacy. Patients might not possess knowledge and medical expertise to contextualize received information and make sense of it (van den Broek & Sergeeva, 2018). Moreover, some patients may not have the skills needed to use digital platforms or mobile apps, no matter how intuitive they are (Alpay et al, 2011).

If the goal of policy makers is to increase mhealth adoption rates, digital and health literacy are big challenges.

Implications for care givers and care receivers

Mobile health apps facilitate the sharing of information for decision making and the responsibilities of selected medical treatments. For some care paths, patients' preferences are less taken into consideration because there is one treatment that is clearly superior. For instance, appendicitis requires an immediate surgery, and meningitis requires specific antibiotics (Reychav et al., 2018). However, most of the medical decisions entail different combinations of possible therapeutic choices. This leads to higher involvement of the patient thus adding value to the treatment because it is more consistent with their preferences and values (Sandlund et al, 2016; Miller et al, 2016). In determining the care path, multiple actors such as clinicians, patients and/or their family and other clinical staff are all engaged.

There are several implications for care givers and receivers because such mobile technologies require higher involvement (Miller et al, 2016). The act of sharing information starts with the clinician, who explains the disease and treatment options available, highlighting benefits and risks. In the same way, patients share their beliefs and values with the medical staff and with the help of the clinician, they better understand their preferences for a specific treatment. In this process, not only the information is shared but also the responsibilities linked to the selected care path while empowering the engaged actors.

Beyond the aims of improving the reach of healthcare, the decision making process and management of chronic diseases, the increasing use of mobile applications is witnessing a shift in care service delivery that ranges from care professionals-controlled to care professionals-managed (Varshney, 2014). Contrary to common wisdom, the use of mobile applications is not limited only to the consultation of personal medical information but also includes a plethora of other care services such as disease prevention, mobile decision making, emergency intervention, monitoring the care path, healthcare data access, and mobile telemedicine just to mention the main services (Viswanathan et al, 2017).

CONCLUSIONS AND FUTURE WORK

This chapter has reviewed the definitions of patient empowerment and mobile health, discussing their main benefits and challenges. In this sense, it can provide common ground on which the academic community and stakeholders can build.

There is still little understanding about how mobile health apps empower patients and about the characteristics of those patients who are empowered. Since the concept of empowerment varies across settings, context and times, longitudinal studies should be conducted to assess the extent of the level of empowerment in different time frames and to understand the key characteristics that affect feelings of empowerment. In particular, little is known about the technological features that influence this feeling. Research should also be conducted on the association between mobile apps and Electronic Healthcare Records (EHR) or Health Information Exchange (HIE) platforms since apps' performance depends on the quality of the information provided. Actual and granular information from the mobile apps logins or patient behavior within the apps should be collected in related questionnaire data or semi-structured interviews.

Mobile health applications are not expected to reduce all care costs, but they provide several benefits that facilitate care service delivery from multiple perspectives. They have the ability to extend the reach of the care services, improve decision making, help prevent and manage chronic diseases and ensure faster emergency care (WHO, 2016; Varshney, 2014, Dadgar & Joshi, 2018). Care organizations have made significant investments to develop and deploy mobile applications and in the process have become closer to the users' needs. In this context, the apps have played the role of mediators between the information made available on web sites and the information users are demanding (Fox & Connolly, 2018).

This paper has implications for healthcare providers, policy makers and technology developers. Mobile technologies can support healthcare providers to better serve their patients by providing home care assistance and personnel training to reduce the need for hospitalization. Hospitals and post-acute care providers can enhance patients' capabilities for off-site monitoring and self-management. Regulations have yet to fully address the new challenges introduced by mHealth.

Prior scholars investigated the effectiveness of mobile health applications (Dadgar and Joshi, 2018), or the impact of mobile apps on patients' learning process (Reychav et al, 2019) or the use of mobile technology to deliver high quality of care at lower costs (Zhou et al, 2017; Anderson and Axelsson, 2011). These studies aimed to collect empirical evidence about the benefits offered and experienced by different care actors, but as in every technology implementation there are both desirable outcomes thus intended but also unintended consequences. Few studies investigated the reasons of law rate adoption of digital technologies in the healthcare industry. A better understanding of the unintended consequences might help technology implementers to better understand patients' needs and to increase their use of technology. Moreover, multiple studies highlighted the benefits and the advantages of being constantly connected to the care providers and personal medical information. Future studies might concentrate and investigate also the downside of a constant connectivity among different care actors to investigate, assess and understand ICT enabled services interactions.

Policy makers deal with fragmented and complex regulatory environments. The authors believe that guarantying privacy and security in mHealth should have top priority. Another important issue is the communication among multiple care actors. Technology developers have led the way in mHealth innovation, specifically targeting individuals with health and wellness apps. However, the ultimate value of the apps themselves depends on interoperability and the connection with existing Electronic Health Records. It is therefore crucial that developers focus on these issues (Deloitte, 2017).

To conclude, mobile health could radically change the way healthcare is viewed, managed and delivered. This chapter has focused on two dimensions of the phenomenon that are fundamentally linked: the use of patient empowerment and mHealth technology. The success of the "mobile health revolution" will depend on the extent to which the use of mHealth products and services lead to better health outcomes at lower costs for the population. To this end, a coordinated collective effort by all stakeholders on promoting digital health education and engagement and protecting data privacy and security of patients' information is becoming more and more urgent (WHO, 2016).

REFERENCES

Adjerid, I., Adler-Milstein, J., & Angst, C. (2018). Reducing Medicare spending through electronic health information exchange: the role of incentives and exchange maturity. *Information Systems Research*, *29*(2), 341-361.

Alpay, L., Van Der Boog, P., & Dumaij, A. (2011). An empowerment-based approach to developing innovative e-health tools for self-management. *Health Informatics Journal*, 17(4), 247–255.

Anders, C., & Cassidy, A. (2014). Effective organizational change in healthcare: Exploring the contribution of empowered users and workers. *International Journal of Healthcare Management*, 7(2), 132–151.

Anderson, R. M., & Funnell, M. M. (2010). Patient empowerment: Myths and misconceptions. *Patient Education and Counseling*, 79(3), 277–282.

Atasoy, H., Greenwood, B. N., & McCullough, J. S. (2018). The digitization of patient care: A review of the effects of electronic health records on health care quality and utilization. *Annual review of public health, 40, 487-500.*

Aujoulat, I., D'hoore, W., & Deccache, A. (2007). Patient empowerment in theory and practice: Polysemy or cacophony? *Patient Education and Counseling*, 66(1), 13–20.

Ayabakan, S., Bardhan, I. R., & Zheng, Z. (2017). A data envelopment analysis approach to estimate it-enabled production capability. *Mis Quarterly*, *41*(1), 189-205.

Boonstra, A., & Broekhuis, M. (2010). Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Services Research*, 10(1), 231.

Bravo, P., Edwards, A., Barr, P. J., Scholl, I., Elwyn, G., & Mcallister, M. (2015). Conceptualising patient empowerment: a mixed methods study. *BMC Health Services Research*, 15(1), 525.

Bulsara, C., Styles, I., Ward, A. M., & Bulsara, M. (2006). The Psychometrics of Developing the Patient Empowerment Scale. *Journal of Psychosocial Oncology*, *24*(2), 1-16.

Castro, E. M., Van Regenmortel, T., Vanhaecht, K., Sermeus, W., & Van Hecke, A. (2016). Patient empowerment, patient participation and patient-centeredness in hospital care: a concept analysis based on a literature review. *Patient education and counseling*, 99(12), 1923-1939.

Cerezo, P. G., Juvé-Udina, M.-E., & Delgado-Hito, P. (2016). Concepts and measures of patient empowerment: a comprehensive review. *Revista Da Escola de Enfermagem Da USP* 50(4), 667-674.

Chatterjee, S., Byun, J., Dutta, K., Pedersen, R. U., Pottathil, A., & Xie, H. (Qi). (2018). Designing an Internet-of-Things (IoT) and sensor-based in-home monitoring system for assisting diabetes patients: iterative learning from two case studies. *European Journal of Information Systems*, 27(6), 670-685.

Conger, J. A., & Kanungo, R. N. (1988). The empowerment process: integrating theory and practice. *Academy of Management Review*, 13(3), 471–482.

Dadgar, M., & Joshi, K. D. (2018). The role of Information and Communication Technology in self-management of chronic diseases: An Empirical Investigation through Value Sensitive Design. *Journal of the Association for Information Systems*, 19(2), 86–112.

Deloitte Ceter for Healt Solutions. Greenspun, H., & Coughlin, S. (2012). mHealth in an mWorld: How mobile technology is transforming health care. *Deloitte Center for Health Solutions*, 1-21.

Deng, X. (Nancy), Joshi, K. D., & Galliers, R. D. (2016). The Duality of Empowerment and Marginalization in Microtask Crowdsourcing: Giving Voice to the Less Powerful Through Value Sensitive Design. *MIS Quarterly*, 40(2), 279–302.

Deng, X., Khuntia, J., & Ghosh, K. (2013). Psychological Empowerment of Patients with Chronic Diseases: The Role of Digital Integration. *Thirty Fourth International Conference on Information Systems* (pp. 1–20).

Doll, W., & Deng, X. (2010). A technology empowerment model for engineering work. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, 41(4), 52-74.

Eng, D., Lee, J. M., Eng, D. S., & Lee, J. M. (2013). The promise and peril of mobile health applications for diabetes and endocrinology. *Pediatric Diabetes*, 14(4), 231–238.

Eskildsen, N. B., Joergensen, C. R., Thomsen, T. G., Ross, L., Dietz, S. M., Groenvold, M., & Johnsen, A. T. (2017). Patient empowerment: a systematic review of questionnaires measuring empowerment in cancer patients. *Acta Oncologica*, 56(2), 156-165.

Fox, G., & Connolly, R. (2018). Mobile health technology adoption across generations: Narrowing the digital divide. *Information Systems Journal*, 28(6), 995-1019.

Free, C., Phillips, G., Galli, L., Watson, L., Felix, L., Edwards, Pate, V., & Haines, A. (2013). The Effectiveness of Mobile-Health Technology-Based Health Behaviour Change or Disease Management Interventions for Health Care Consumers: A Systematic Review. *PLoS Med* 10(1): e1001362.

Funnell, M. M., Anderson, R. M., Arnold, M. S., Barr, P. A., Donnelly, M., Johnson, P. D., ... & White, N. H. (1991). Empowerment: an idea whose time has come in diabetes education. *The Diabetes Educator*, *17*(1), 37-41.

Galanakis, M., Tsoli, M., & Darviri, S. (2016). The Effects of Patient Empowerment Scale in Chronic Dis-eases. *Psychology*, 7(11), 1369–1390.

Ghosh, K., Khuntia, J., Chawla, S., & Deng, X. (2014). Media Reinforcement for Psychological Empowerment in Chronic Disease Management. *CAIS*, *34*, 22.

Holmström, I., & Röing, M. (2010). The relation between patient-centeredness and patient empowerment: A discussion on concepts. *Patient Education and Counseling*, 79(2), 167–172.

Hoque, R., & Sorwar, G. (2017). Understanding factors influencing the adoption of mHealth by the elderly: An extension of the UTAUT model. *International Journal of Medical Informatics*, 101, 75–84.

Huang, K.-Y., & Ran, W. (2014). Not Just for Support: Companionship Activities in Healthcare Virtual Support Communities. *Communications of the Association for Information Systems*, 34(29).

Iyengar, S., & Lepper, M. (2000). When Choice is Demotivating: Can One Desire Too Much of a Good Thing? *Journal of Personality and Social Psychology*, 79(6), 995–1006.

Jean, B., Koffi, B., Yazdanmehr, A., & Mahapatra, R. (2018). Mobile Health Mobile Health Privacy Concerns-A Systematic Review. *Twenty-fourth Americas Conference on Information Systems*.

Johnson, M. O., Rose, C. D., Dilworth, S. E., & Neilands, T. B. (2012). Advances in the conceptualization and measurement of Health Care Empowerment: development and validation of the Health Care Empowerment inventory. *PLoS One*, *7*(9), e45692.

Kenny, G., & Connolly, R. (2017). Towards an Inclusive World : Exploring M-Health Adoption Across Generations. *Twenty-fifth European Conference on Information Systems (ECIS),* Guimarães, Portugal, June 5-10, 2017 (pp. 1129-1144).

Khuntia, J., Yim, D., Tanniru, M., & Lim, S. (2017). Patient empowerment and engagement with a health infomediary. *Health Policy and Technology*, 6, 40–50.

Klasnja, P., & Pratt, W. (2012). Healthcare in the pocket: Mapping the space of mobile-phone health interventions. *Journal of Biomedical Informatics*, 45, 184–198.

Klecun, E. (2016). Transforming healthcare: Policy discourses of IT and patient-centred care. *European Journal of Information Systems*, 25(1), 64–76.

Kwon, H. E., Dewan, S., Oh, W., & Kim, T. (2017). Efficacy of a Health App for Obesity and Overweight Management: A Hidden Markov Model. *International Conference on Information Systems*, 1-17.

Liberati, E. G., Gorli, M., Moja, L., Galuppo, L., Ripamonti, S., & Scaratti, G. (2015). Exploring the practice of patient centered care: The role of ethnography and reflexivity. *Social Science and Medicine*, 133, 45–52.

Liu, F., Guo, X., & Ju, X. (2018). Routine Use of Mobile Health Services: Promotion or Prevention. *International Conference on Information Systems* (pp. 1–10).

Loukanova, S., Molnar, R., & Bridges, J. F. P. (2007). Promoting patient empowerment in the healthcare system: Highlighting the need for patient-centered drug policy. *Expert Review of Pharmacoeconomics and Outcomes Research*, 7(3), 281–289.

McKinsey, (2013). mHealth: A new vision for healthcare. *McKinsey&Company*, 1-20.

Manda, T. D., & Herstad, J. (2015). Enacting technology: Accounting for the interplay between mHealth solutions and existing paper-based data reporting practices. *Information Technology and People*, 28(3), 442–465.

Marcolino, M. S., Oliveira, J. A. Q., D'Agostino, M., Ribeiro, A. L., Alkmim, M. B. M., & Novillo-Ortiz, D. (2018). The impact of mHealth interventions: systematic review of systematic reviews. *JMIR mHealth and uHealth*, *6*(1), e23.

Maunsell, E., Lauzier, S., Brunet, J., Pelletier, S., Osborne, R. H., & Campbell, H. S. (2014). Health-related empowerment in cancer: Validity of scales from the Health Education Impact Questionnaire. *Cancer, 120*(20), 3228-3236.

Maynard, M. T., Gilson, L. L., & Mathieu, J. E. (2012). Empowerment-Fad or Fab? A Multilevel Review of the Past Two Decades of Research. *Journal of Management*, 38(4), 1231–1281.

McAllister, M., Dunn, G., Payne, K., Davies, L., & Todd, C. (2012). Patient empowerment: the need to consider it as a measurable patient-reported outcome for chronic conditions. *BMC Health Services Research*, *12*(1), 157.

Meng, F., Zhang, X., Guo, X., Lai, K. H., & Zhao, X. (2019). How Do Patients with Chronic Diseases Make Usage Decisions regarding Mobile Health Monitoring Service?. *Journal of Healthcare Engineering*, *2019*.

Middleton, C., Scheepers, R., & Tuunainen, V. K. (2014). When mobile is the norm: researching mobile information systems and mobility as post-adoption phenomena. *European Journal of Information Systems, 23*(5), 503-512.

Miller, A. D., Pollack, A. H., & Pratt, W. (2016). Bursting the information bubble: Identifying opportunities for pediatric patient-centered technology. In *AMIA Annual Symposium Proceedings* (Vol. 2016, p. 894). *American Medical Informatics Association.*

Noteboom, C., & Al-Ramahi, M. (2018). What are the Gaps in Mobile Patient Portal? Mining Users Feedback Using Topic Modeling. Proceedings of the 51st *Hawaii International Conference on System Sciences*, 1-16.

Nouri, R., R Niakan Kalhori, S., Ghazisaeedi, M., Marchand, G., & Yasini, M. (2018). Criteria for assessing the quality of mHealth apps: a systematic review. *Journal of the American Medical Informatics Association, 25*(8), 1089-1098.

Peleg, M., Michalowski, W., Wilk, S., Parimbelli, E., Bonaccio, S., O'Sullivan, D., ... & Carrier, M. (2018). Ideating Mobile Health Behavioral Support for Compliance to Therapy for Patients with Chronic Disease: A Case Study of Atrial Fibrillation Management. *Journal of medical systems, 42*(11), 234.

Peleg, M., Shahar, Y., Quaglini, S., Fux, A., García-Sáez, G., Goldstein, A., ... & Parimbelli, E. (2017). MobiGuide: a personalized and patient-centric decision-support system and its evaluation in the atrial fibrillation and gestational diabetes domains. *User Modeling and User-Adapted Interaction*, 27(2), 159-213.

Perera, G., Holbrook, A., Thabane, L., Foster, G., & Willison, D. J. (2011). Views on health information sharing and privacy from primary care practices using electronic medical records. *International journal of medical informatics, 80*(2), 94-101.

Permwonguswa, S., Khuntia, J., Yim, D., & Gregg, D. (2017). Empowerment and knowledge sharing in health infomediary: empirical evidence from reconstructive surgery patients. In *Twenty-third Americas Conference on Information Systems*, Boston 2017.

Prgomet, M., Georgiou, A., & Westbrook, J. I. (2009). The impact of mobile handheld technology on hospital physicians' work practices and patient care: a systematic review. *Journal of the American Medical Informatics Association*, *16*(6), 792-801.

Pung, A., Fletcher, S. L., & Gunn, J. M. (2018). Mobile app use by primary care patients to manage their depressive symptoms: qualitative study. *Journal of medical Internet research, 20*(9), e10035.

Rai, A., Chen, L., Pye, J., & Baird, A. (2013). Understanding determinants of consumer mobile health usage intentions, assimilation, and channel preferences. *Journal of Medical Internet Research, 15*(8), e149.

Research2Guidance (2018). mHealth Economics 2017/2018 – Connectivity in Digital Health. *Research2Guidance,* 1-17.

Reychav, I., Beeri, R., Balapour, A., Raban, D. R., Sabherwal, R., & Azuri, J. (2019). How reliable are self-assessments using mobile technology in healthcare? The effects of technology identity and self-efficacy. *Computers in Human Behavior*, 91, 52–61.

Reychav, I., Parush, A., Mchaney, R., Hazan, M., & Moshonov, R. (2018). The use of mobile technology in waiting rooms to leverage women's empowerment: A conceptual context. *Health Informatics Journal*, 24(3), 277–292.

Rogers, S., Chamberlin, J., Ellison, M. L., & Crean, T. (1997). A consumer-constructed scale to measure empowerment among users of mental health services. *Psychiatric Services*, 48(8).

Sandlund, M., Lindgren, H., Pohl, P., Melander-Wikman, A., Bergvall Kåreborn, B., & Lundin Olsson, L. (2016). Towards a mobile exercise application to prevent falls: a participatory design process. *International Journal of Child Health and Human Development*, *9*(3), 389-398.

Singh, R., Mathiassen, L., Stachura, M. E., & Astapova, E. V. (2011). Capabilities in Home Health : IT-Enabled Transformation of Post-Acute Care *Journal of the Association for Information Dynamic*, 12, 163–188.

Small, N., Bower, P., Chew-Graham, C. A., Whalley, D., & Protheroe, J. (2013). Patient empowerment in long-term conditions: development and preliminary testing of a new measure. *BMC Health Services Research*, *13*(1), 263..

Spreitzer, G. M. (1995). Psychological Empowerment in the Workplace: Dimensions, Measurement, and Validation. *Academy of Management Journal*, 38(5), 1442–1465.

Srivastava, S. C., Shainesh, G., Barrett, M., Davidson, E., Prabhu, J., & Vargo, S. L. (2015). Bridging the Service Divide Through Digitally Enabled Service Innovations: Evidence from Indian Healthcare Service Providers. *MIS Quarterly*, 39(1), 245–267.

Storni, C. (2014). Diabetes self-care in-the-wild: Design challenges for personal health record systems and self-monitoring technologies. *Information Technology & People*, 27(4), 397-420.

Thomas, K. W., & Velthouse, B. A. (1990). Cognitive elements of empowerment: An "interpretive" model of intrinsic task motivation. *Academy of Management Review*, *15*(4), 666-681.

Trocin, C., Arkhipova, D., Lee, G., Vaia, G., & Saccavini, C., (2018). The Effect of Network Centrality of Medical Specialists on Their Performance: Evidence from an Italian Health Information Exchange Platform. *International Conference on Information Systems Proceedings* (ICIS 2018), San Francisco, USA.

van den Broek, E., & Sergeeva, A. (2018). Empowering Patients Through Data: Promise versus Practice. *Academy of Management Global Proceedings*, (2018), 97.

Varshney, U. (2014). Mobile health: Four emerging themes of research. *Decision Support Systems*, *66*, 20-35.

Viswanathan, V., Hollebeek, L. D., Malthouse, E. C., Maslowska, E., Jung Kim, S., & Xie, W. (2017). The dynamics of consumer engagement with mobile technologies. *Service Science*, *9*(1), 36-49.

Webb, D. G., Horne, R., & Pinching, A. J. (2001). Treatment-related empowerment: preliminary evaluation of a new measure in patients with advanced HIV disease. *International journal of STD & AIDS*, *12*(2), 103-107.

Webster, J., & Watson, R. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, *26*(2), Xiii-Xxiii.

Wentzer, H. S., & Bygholm, A. (2013). Narratives of empowerment and compliance: Studies of communication in online patient support groups. *International Journal of Medical Informatics*, 82, e386–e394.

Wiljer, D., Urowitz, S., Apatu, E., DeLenardo, C., Eysenbach, G., Harth, T., ... & Leonard, K. (2008). Patient accessible electronic health records: exploring recommendations for successful implementation strategies. *Journal of Medical Internet Research*, 10(4), e34.

Wilson, T. E., Kay, E. S., Turan, B., Johnson, M. O., Kempf, M. C., Turan, J. M., ... & Goparaju, L. (2018). Healthcare empowerment and HIV viral control: mediating roles of adherence and retention in care. *American Journal of Preventive Medicine*, *54*(6), 756-764.

World Health Organization. (2016). *Global diffusion of eHealth: making universal health coverage achievable: report of the third global survey on eHealth* (No. 9789241511780). World Health Organization.

World Health Organization (2011). mHealth: New horizons for health through mobile technologies. Authors: Kay, M., Santos, J., & Takane, M, 64(7), 66-71.

Wu, J.-H., Wang, S.-C., & Lin, L.-M. (2007). Mobile computing acceptance factors in the healthcare industry: A structural equation model. *International Journal of Medical Informatics*, 76, 66–77.

Yaraghi, N., Du, A. Y., Sharman, R., Gopal, R. D., & Ramesh, R. (2014). Health information exchange as a multisided platform: Adoption, usage, and practice involvement in service co-production. *Information Systems Research*, *26*(1), 1-18.

Yen, C. C., Chang, L., Tai, B. C., Chan, H. C., Choolani, M., Lim, S., … Xue, L. (2011). A study on Singaporean women’s acceptance of using mobile phones to seek health information. *International Journal of Medical Informatics*, *80*(12), e189-e202.

Zhao, Y., Ni, Q., & Zhou, R. (2018). What factors influence the mobile health service adoption? A meta-analysis and the moderating role of age. *International Journal of Information Management*, 43, 342–350.

Zimmerman, M. A. (1995). Psychological empowerment: Issues and illustrations. *American Journal of Community Psychology*, *23*(5), 581-599.

KEY TERMS AND DEFINITION

Empowerment: *“Empowerment is a process by which people, organizations, and communities gain mastery over issues of concern to them”* (i.e. Zimmerman, 1995).

Emotional empowerment: *“The process of giving power to patients over their medical treatment means to give more decisional, cognitive, emotional control, and hope to improve personal quality of life”* (i.e. Doll & Deng, 2010; Huang & Ran, 2014; Wilson et al., 2018).

Psychological empowerment: *"Psychological Empowerment is a feeling of control, a critical awareness of one’s environment, and an active engagement in it"* (i.e. Spreitzer, 1995).

Patient empowerment: *“Patient empowerment is a process designed to facilitate self-directed behavior change. The empowerment approach involves facilitating and supporting patients to reflect on their experience of living with diabetes.”* See Table 2 for variations for the definitions.

Mobile application: The key concept of the mobile application is to offer a tailored service for digital health that directly and predominantly involves the patient (patient-centered-healthcare-ecosystem).

Digital health: Digital health refers to the act of providing care services through the use of digital platforms such as Electronic Healthcare Records (EHR), Health Information Exchanges (HIE) and mobile devices to allow patients to self-manage their care path.

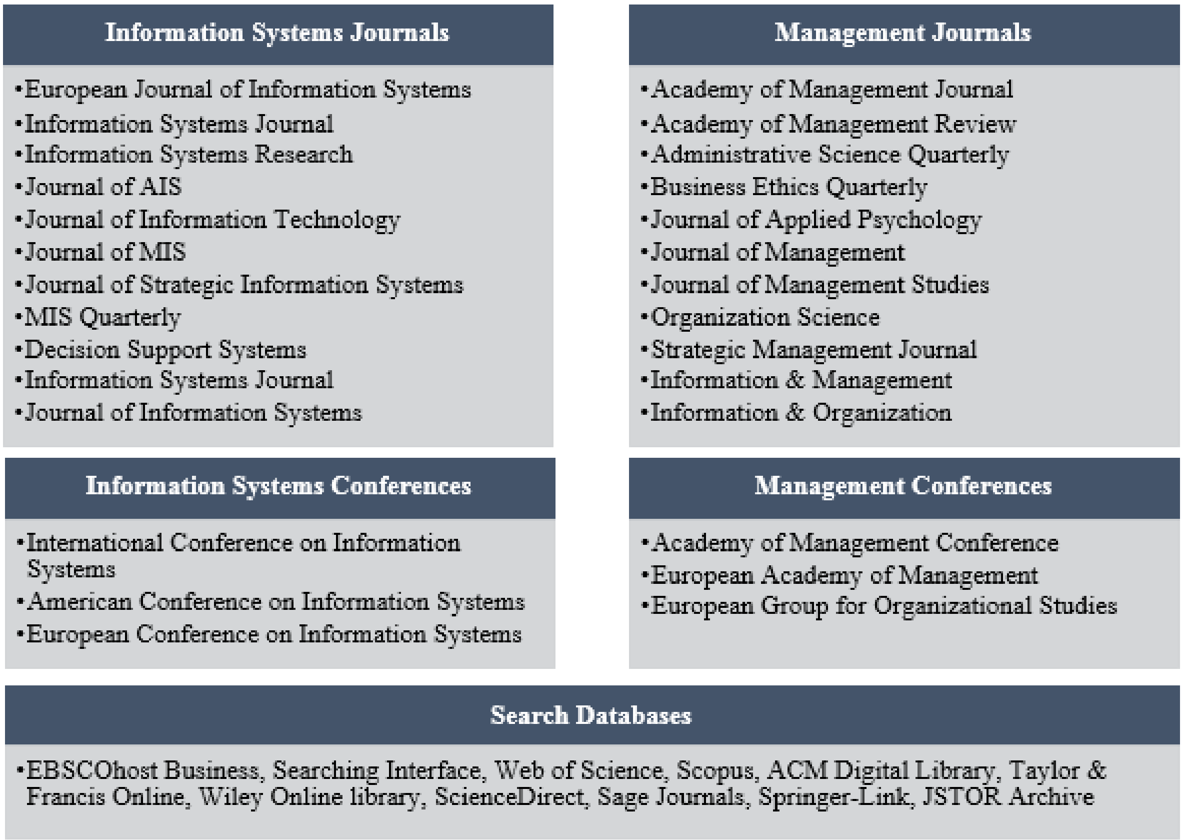
Mobile health: “*Mobile health is defined as medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices”* (i.e. WHO, 2016).

Digital literacy: Digital literacy refers to the knowledge and capabilities of all care actors with a specific focus on patients to use digital tools, platforms and devices for self-managing their care path.

Health literacy: Health literacy refers to the knowledge and capabilities of patients to accomplish specific tasks to improve personal health status according to the indications of the personal physician.

FIGURES

Figure 1 - Selection of Research Sources by Field



Information Systems Journals

- European Journal of Information Systems
- Information Systems Journal
- Information Systems Research
- Journal of AIS
- Journal of Information Technology
- Journal of MIS
- Journal of Strategic Information Systems
- MIS Quarterly
- Decision Support Systems
- Information Systems Journal
- Journal of Information Systems

Management Journals

- Academy of Management Journal
- Academy of Management Review
- Administrative Science Quarterly
- Business Ethics Quarterly
- Journal of Applied Psychology
- Journal of Management
- Journal of Management Studies
- Organization Science
- Strategic Management Journal
- Information & Management
- Information & Organization

Information Systems Conferences

- International Conference on Information Systems
- American Conference on Information Systems
- European Conference on Information Systems

Management Conferences

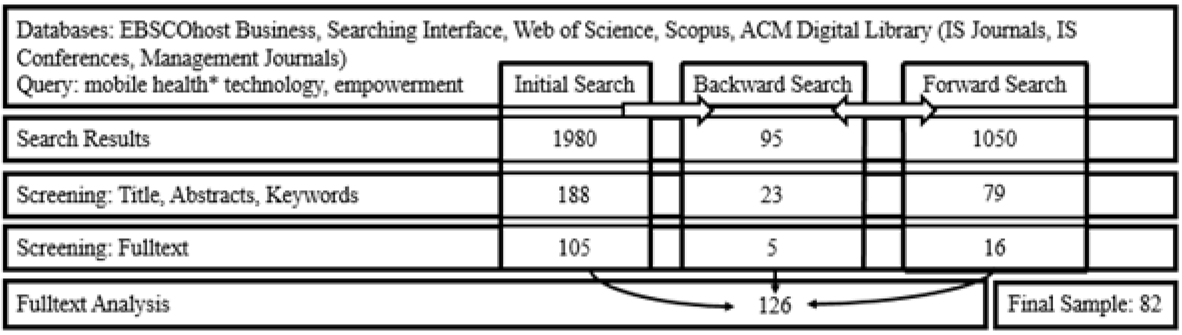
- Academy of Management Conference
- European Academy of Management
- European Group for Organizational Studies

Search Databases

- EBSCOhost Business, Searching Interface, Web of Science, Scopus, ACM Digital Library, Taylor & Francis Online, Wiley Online library, ScienceDirect, Sage Journals, Springer-Link, JSTOR Archive

Source: Authors' elaboration

Figure 2 - Selection of Research Papers



Databases: EBSCOhost Business, Searching Interface, Web of Science, Scopus, ACM Digital Library (IS Journals, IS Conferences, Management Journals) Query: mobile health* technology, empowerment	Initial Search	Backward Search	Forward Search
Search Results	1980	95	1050
Screening: Title, Abstracts, Keywords	188	23	79
Screening: Fulltext	105	5	16
Fulltext Analysis		126	Final Sample: 82

Source: Authors' elaboration

TABLES

Table 1 - Definitions of patient empowerment

References	Definitions
Holmström, I., & Röing, M. (2010)	*"Patient empowerment may place greater demands on the caregivers. It requires of caregivers to first develop educational skills in empowering people to make informed choices about their own health. Patient empowerment requires that caregivers learn self-management education and the teaching of problem-solving skills to patients as a complement to traditional patient education, in order to increase patients' understanding of their situations, and consequently, enhance lasting change in the patients' lives. Patient empowerment can be said to have an important function for people with disabilities. It can help them reject the passive 'sick role' status relegated on them by past medical and health professions."*
Castro, E. M., Van Regenmortel, T., Vanhaecht, K., Sermeus, W., & Van Hecke, A. (2016)	*"a process that enables patients to exert more influence over their individual health by increasing their capabilities to gain more control over issues that they themselves define as important."*
Deng, X., Khuntia, J., and Ghosh, K. 2013	*"The concept of psychological empowerment has been viewed from both relational and motivational perspectives. Empowerment means delegating authority to, or sharing resources with subordinates. This view treats empowerment as psychologically enabling, and enhancing an individual's internal efficacy."*
Chiauzzi, E., DasMahapatra, P., Cochin, E., Bunce, M., Khoury, R., and Dave, P. 2016.	*"Key factors in patient empowerment are positive patient– provider interactions and knowledge and personal control—were identified. Levels of these empowerment factors varied across disease type."*
Segal, S. P., Silverman, C., & Temkin, T. (1993).	*"a process of 'gaining control over one's life situation influencing the organizational and societal structure in which one lives".*
Aujoulat, I., d'Hoore, W., & Deccache, A. (2007)	*"Empowerment may be defined as a complex experience of personal change. It is guided by the principle of self- determination and may be facilitated by health-care providers if they adopt a patient-centered approach of care which acknowledges the patients' experience, priorities and fears."*
McAllister, M., Dunn, G., Payne, K., Davies, L., & Todd, C. (2012).	*"Combining this broader definition of rational decision-making with a patient empowerment approach would require clinicians to be more open minded and explicit about what outcomes patients might want, what norms and constraints the patient feels are important, the values and uncertainties the patient considers apply to themselves and the world."*

Khuntia, J., Yim, D., Tanniru, M., & Lim, S. (2017)	*Patient empowerment is nothing but a capacity-building process. Empowered patients believe that they can play an active role in the management of their own health and make decisions related to it. As a result, they experience greater control over their health management process.*
Funnell, M. M., & Anderson, R. M. (2004)	*Empowerment is a patient-centered, collaborative approach tailored to match the fundamental realities of diabetes care. Patient empowerment is defined as helping patients discover and develop the inherent capacity to be responsible for one's own life"*
Funnell, M. M., Anderson, R. M., Arnold, M. S., Barr, P. A., Donnelly, M., Johnson, P. D., ... & White, N. H. (1991)	*"We have defined the process of empowerment as the discovery and development of one's inherent capacity to be responsible for one's own life. People are empowered when they have sufficient knowledge to make rational decisions, sufficient control and resources to implement their decisions, and sufficient experience to evaluate the effectiveness of their decisions. Empowerment is more than an intervention or strategy to help people make behavior changes to adhere to a treatment plan. Fundamentally, patient empowerment is an outcome. Patients are empowered when they have knowledge, skills, attitudes, and self-awareness necessary to influence their own behavior and that of others in order to improve the quality of their lives"*
Anderson, R. M., & Funnell, M. M. (2010)	*"Patient empowerment is a process designed to facilitate self-directed behavior change. The empowerment approach involves facilitating and supporting patients to reflect on their experience of living with diabetes. Self-reflection occurring in a relationship characterized by psychological safety, warmth, collaboration, and respect is essential for laying the foundation for self-directed positive change in behavior, emotions, and/ or attitudes"*
Zimmerman, M. A. (1995)	*"Empowerment is a process by which people, organizations, and communities gain mastery over issues of concern to them' and 'PE (Psychological Empowerment) is a feeling of control, a critical awareness of one's environment, and an active engagement in it."*
Small, N., Bower, P., Chew-Graham, C. A., Whalley, D., & Protheroe, J. (2013)	*"An enabling process or outcome arising from communication with the health care professional and a mutual sharing of resources over information relating to illness, which enhances the patient's feelings of control, self-efficacy, coping abilities and ability to achieve change over their condition. empowerment is a psychological state that occurs as a result of effective communication in health care, and which acts as a determinant of consequent participation and self-management."*
Wentzer, H. S., & Bygholm, A. (2013)	*"A collaborative approach in which health professionals help patients acquire the knowledge necessary to make informed decisions and whose outcome is a patient who is responsible for the management of his/ her illness."*

Source: Authors' elaboration

Table 2 - Key factors of patient empowerment

Key factors	Definitions	References
Motivation	*"Empowerment means delegating authority to, or sharing resources with subordinates. This view treats empowerment as psychologically enabling, and enhancing an individual's internal efficacy."* *"When individuals perceive themselves to have control and cope with social life events, they believe they adequately can confront with other people."* *"Psychological empowerment is a multifaceted motivational construct composed of four cognitions that provide an energetic role to the employee."*	(Kwon et al, 2017; Deng et al, 2013; Klasnja and Pratt, 2012; Alpay et al, 2011; Spreitzer, 1995; Thomas and Velthouse, 1990; Konger and Kanungo, 1988)
Self-efficacy	Empowered patients are defined as those individuals that are aware of their health conditions and have the capacity to make decisions about their health, and to take control over their life in order to reach their goals related to health conditions. The concept of self-efficacy is the most used and studied measure related to the concept of empowerment. This means to make more rational decisions, to decrease their dependence on health services and achieve the desired outcome.	(Reychav et al, 2019; Galanakis et al., 2016; McAllister et al, 2012)
Ownership	*"The ownership domain assesses the extent to which a person feels responsible for his or her own health. […]consumers with high ownership scores were more likely to look up their health symptoms online before going to the doctor, compared to those with low ownership scores."*	(Lynch et al, 2016)
Navigation	*"The navigation domain measures how skilled a person is at using the health care system. [.....], those with high navigation scores were more than twice as likely to arrive at a health care visit with a prepared list of questions for the doctor as those with low navigation scores."*	(Lynch et al, 2016)

Source: Authors' elaboration

Table 3 - Definitions of mobile health

References	Definitions
Liu, F., Guo, X., & Ju, X. (2018)	*"mHealth is defined as one type of healthcare service that can provide mobile device users with ubiquitous and pervasive access to medical advice and information. It changes the spectrum of healthcare services from crisis intervention to health promotion, prevention, and self-management."*
World Health Organization (2011)	*"The Global Observatory for eHealth (GOe) defined mHealth or mobile health as medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices."*
Reychav, I., Parush, A., McHaney, R., Hazan, M., & Moshonov, R. (2018)	*"m-Healthcare solutions are used in the remote monitoring of patients, delivering care, reducing costs, saving time, and increasing accessibility and geographical coverage of services"*
Meng, F., Guo, X., Lai, K., & Zhao, X. (2018)	*"mHealth service can be defined as the use of mobile information and communication technologies (ICTs) endowed with the capability of managing and delivering health information timely, between end-users and health professionals to improve patient safety and the quality of healthcare"*
Fox, G., & Connolly, R. (2018)	*"the utilization of mobile technologies to realize health objectives,ealth encompasses a variety of mobile applications, wearable devices, and health record systems. Mobile health can provide additional benefits including removing geographic barriers to health information, facilitating access to customized information, and removing the stigmatization often associated with other medical devices"*
Kwon, H. E., Dewan, S., Oh, W., & Kim, T. (2017)	*"mobile apps enable users to upload their records immediately after an event occurs, thereby alleviating concerns associated with inaccuracies that potentially emanate from remembering the activities that people engage in over the long-term"*

Reychav, I., Beeri, R., Balapour, A., Raban, D. R., Sabherwal, R., & Azuri, J. (2019)	*"Mobile computing offers fairly cheap and accessible outlets with wide-spread functionalities that are adopted in business and healthcare. In healthcare, especially in the most recent years, mobile devices are used extensively to improve patient life quality and health. Mobile healthcare or m-Healthcare solutions are used in the remote monitoring of patients, delivering care, reducing costs, saving time, and increasing accessibility and geographical coverage of services"*
Kwon, H., Lee, K., & Lee, B. (2014)	*"Through mobile personal health record (mPHR) applications, users can access their health information easily. They enable patients to get their health information whenever and wherever they are. Patients are able to record and update their health conditions such as weight, blood pressure, and blood glucose level, and keep track of such information for themselves. This information can be shared with physicians, helping them check the patient's current conditions, give instructions that patients are supposed to follow, and provide more precise and customized care services."*
Wu, L., Li, J. Y., & Fu, C. Y. (2011)	*"The use of mobile healthcare is closely related to the patients' health and life. Mobile healthcare is an emerging technology for personal use which is often used voluntarily. It involves both technological and organizational aspects on the level of individual."*
Nouri, R., R Niakan Kalhori, S., Ghazisaeedi, M., Marchand, G., & Yasini, M. (2018)	*"Mobile health can be defined as the use of wireless communication devices to support public health and clinical practice or soft wares that are incorporated into smartphones to improve health outcome, health research, and health care services."*
Lim, S., Xue, L., Yen, C. C., Chang, L., Chan, H. C., Tai, B. C., & Choolani, M. (2011)	*"health applications facilitate the public's self-management of their own health by offering a rich library of health information which educate users on disease prevention, promote fitness and offer tips on wellness."*
Rai, A., Chen, L., Pye, J., & Baird, A. (2013)	*"Mobile health is defined as the use of mobile communication technology to aid health services delivery. mHealth could increase their control over their health care, provide more convenient access to needed health information, and ultimately improve their health care costs and quality."*
Wu, J. H., Wang, S. C., & Lin, L. M. (2007)	*"Mobile IT/IS applications in health care can be recognized as both emerging and enabling technologies that have been applied in several countries for emergency care or general health care."*

Sun, Y., Wang, N., Guo, X., & Peng, Z. (2013)	*"Mobile health services (MHS) can be defined as a variety of healthcare services, including health consulting, hospital registering, and location-based services delivered through mobile communications and network technologies."*
Li, H., Wu, J., Gao, Y., & Shi, Y. (2016)	*"Healthcare wearable devices includes both, fitness and medical wearable devices. There are two main kinds of healthcare wearable devices in the market, fitness and medical wearable devices. Users can monitor their health conditions such as sleep, calories burned, heart rate, and distance traveled in real time."*
Hoque, R., & Sorwar, G. (2017)	*"mHealth is considered to be an easy, low cost, and affordable solution to improve access to healthcare services especially for those with shortage healthcare resources. "*
Pung, A., Fletcher, S. L., & Gunn, J. M. (2018)	*"Mobile apps are emerging as tools with the potential to revolutionize the treatment of mental health conditions such as depression. Apps are advanced technological tools with multiple capabilities and have been postulated to revolutionize mental health treatment in myriad ways, such as by allowing for the affordable and accessible delivery of interventions, providing real-time diagnostic and monitoring support, enhancing therapeutic relationships, augmenting engagement with treatments, and even acting as “virtual coaches”."*
Zhao, Y., Ni, Q., & Zhou, R. (2018)	*"Mobile health services (MHS) have been defined as providing health services and information through the use of mobile communication technology, such as smart phones, 3G/4G mobile networks and satellite communications. Mobile health could track health condition of people, evaluate the trend of its evolution and provide timely treatment. Mobile health services can save the time and cost of diagnosis. It plays a positive role in improving the quality and the efficiency of medical resources. "*
Eng, D. S., & Lee, J. M. (2013)	*"Mobile health, referred to as mHealth, is defined as mobile computing, medical sensor and communication technologies that can enhance chronic disease care beyond the traditional out-patient physician-patient encounter. This includes applications that run on mobile phones, sensors that track vital signs, health activities and cloud-based computing systems."*

Source: Authors’ elaboration

APPENDIX

Self-determination, autonomy and self-efficacy definitions

Terminology	Definition	References
Self-determination	*A patients' sense of having choice in initiating and regulating tasks and processes*	(Aujoulat et al., 2007; Doll and Deng, 2010)
Autonomy	*The degree of choice patients have in using mobile technology for their healthcare conditions*	(Aujoulat et al., 2007; Holmström and Röing, 2010; Dadgar & Joshi, 2018)
Self-efficacy	*A patients' belief in his/her ability to use the mobile health technology for own healthcare path*	(McAllister et al., 2012; Small et al, 2013; Galanakis et al., 2016; Reychav et al., 2019)

Source: Authors' elaboration

The Unintended Consequences of Digital Affordances: a Case of Italian Electronic Health Records Implementation

Cristina Trocin[1], Gwanhoo Lee[2], Giovanni Vaia[3], Claudio Saccavini[4]

Abstract

An Electronic Health Record (EHR) platform, used to share medical information during patients' care path, often leads to a range of unintended consequences, which have significant impacts on its implementation. The extant studies on technology-driven organizational change concentrated on expected results that the implementer had in mind. This focus neglects unintended consequences of goal oriented changes in healthcare. To shed light on this important topic, we examined the important unintended consequences of implementing an EHR platform and their impacts on different types of care actors. Our study uses a grounded theory approach. We found that an EHR platform affords care actors to deliver intended consequences such as to connect multiple care settings, to provide rich and updated information for planning and remote monitoring, to provide continuous access to medical data and to improve the quality of care. However, when the consequences of salient digital affordances are not foreseen, the system is likely to create multiple unintended consequences such as digital divide generation, increased workload, abuse of empowered patients' role or digital literacy requirements which decreases EHR implementation. If their dysfunctional side effects are not mitigated, they tend to outweigh the benefits of the platform and lead to undesirable organizational change. Our study contributes to the literature by deepening our understanding of the relationship between digital affordances, their unintended consequences, and their impacts on digital platform implementation.

Keywords: *digital affordances, unintended consequences, electronic health records, digital platforms, grounded theory, technology-driven organizational change*

Presented at

- 34th European Group for Organizational Studies, July 2–7, 2018, Tallinn, Estonia
- AOM Doctoral Consortium (2018) Selected Participant, Chicago, USA
- ICIS Doctoral Consortium (2018) Selected Participant, San Francisco, USA

---

[1] Corresponding author, Department of Management, Ca' Foscari University of Venice, Italy

[2] Kogod School of Business, American University, Washington DC, USA

[3] Department of Management, Ca' Foscari University of Venice, Italy

[4] Consorzio Arsenal IT, Centro Veneto Ricerca e Innovazione per la Sanità Digitale

INTRODUCTION

Digital technologies have the potential to create a new paradigm for a value-based, patient-centric, and efficient healthcare system. They facilitate the delivery of health services by diminishing the distances, the time and increasing the cooperation of care physicians, professionals and patients in an integrated process. A healthcare ecosystem involves multiple actors who have often-conflicting interests, engaging in complex interactions (Angst et al, 2010; Free et al, 2013; McKinley and Scherer, 2000). As a result, any change to the healthcare ecosystem is likely to produce unintended outcomes. Although prior research has generated valuable insights on digital health implementation from different actors' perspectives, less attention was devoted to investigating unintended changes emerged from technology implementation.

Among successful initiatives of digital artifacts, Electronic Health Record (EHR) can significantly contribute to the improvement of care cost and quality by combining clinical, financial, and operational data (Atasoy et al, 2017; Spagnoletti et al, 2015; Angst et al, 2010). However, there is a consensus that digitized healthcare information has not achieved its full potential yet (Kohli and Tan, 2016). We argue that one of the important reasons for this shortcoming is our lack of understanding and management of unintended consequences during the EHR implementation.

Although a considerable amount of research has investigated whether and how digital initiatives delivered their intended consequences, less attention has been devoted to their unintended results (McKinley and Scherer, 2000; Harris and Ogbonna, 2002; Zheng et al, 2016; Hah and Bharadwaj, 2012). Research in this area is crucial because unintended outcomes often have unclear impacts on organizations. For example, digital platforms typically involve multiple actors who have often-conflicting interests, engaging in complex interactions (Angst et al, 2010; Free et al, 2013; McKinley and Scherer, 2000). As a result, any change to the environment is likely to produce unintended outcomes. It is important to advance our understanding of important unintended consequences to realize the full potential of digital platforms. This understanding will help us to better assess their implementation performance and help mitigate its dysfunctional side effects to increase their use.

The concept of affordance offers a powerful lens for investigating the outcomes of the interactions between technology and actors in care organizations, as it provides analytical tools for describing how tasks are accomplished to reach a specific goal and how the accomplishment of these tasks is shaped by the settings' physical and social characteristics. We believe affordances and digital artifacts offer a suitable theoretical perspective to investigate technology-driven organizational change (Burton-Jones and Volkoff, 2017; Strong et al, 2014; Fayard and Weeks, 2014; Leonardi, 2013). An affordance is the potential of behaviors and actions that emerged from the interactions between goal-oriented actors and digital artifacts (Volkoff and Strong, 2013).

Substantial theoretical efforts have been made to adapt the theory of affordance from ecological psychology (Merton, 1968; Gibson, 1986; Turvey, 1992; Stoffregen, 2003) to organization and Information Systems fields (Heatchbuy, 2001; Jones & Karsten, 2008; Markus & Silver, 2008; Zammuto et al., 2007). Some scholars focused on the relation between technology and individuals or groups of individuals (Leonardi, 2011, 2013b) and others expanded their focus to organizational or societal levels. Furthermore, new middle-range theories have been developed, including contextualized theories of effective use (Burton-Jones and Volkoff, 2017) and organization-EHR affordance actualization theory (Strong et al, 2014).

The purpose of our paper is to empirically investigate the unintended consequences of an EHR implementation in Italy through the theory of affordance and the unintended consequences perspective. To achieve this goal, we address the following questions: What are the important unintended consequences of an Electronic Health Record implementation? How do they affect different types of goal-oriented care actors? Grounded theory guided us to collect semi-structured interviews from different categories of care actors, to analyze qualitative data and to interpret the results.

We present our study in four sections. The next section presents our theoretical orientation and highlights the key elements of extant literature. Then we describe the specific research setting and the procedures followed for data analysis. A subsequent section discusses our findings and their impacts on actors involved in purposive social actions. We conclude with implications for theory and practice and point to further research.

THEORETICAL BACKGROUND

In this section, we briefly review the theory of affordances, the perspectives on unintended consequences, and prior research on digital platforms.

Theory of affordance

The concept of affordance has been developed by the ecological psychologist Gibson (1986). His main interest was to study animals' visual perception of the surroundings. The author believed that animals do not perceive each detail of an object, but they perceive holistically what that object will enable them to do without requiring cognitive analysis of object characteristics and features. He sustained that:

> *"The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. ...I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment"* (Gibson, 1979, p. 127).

Based on Gibson's original definition, an affordance is what is offered, provided or furnished to someone, thus "*with reference to an observer*". An object is defined by what it affords, or provides or offers in a specific context and to a specific user (Strong et al, 2014). The theory of affordance says that an actor, with a specific goal in mind, perceives an object in its environment in terms of how it can be used and of action possibilities for reaching that goal (Volkoff and Strong, 2017).

Three key elements are involved in the affordance theory, which are actor, object and environment. Gibson believed that affordances exist independently from the environment and actor's perception (Gibson, 1986). For example, an email system affords an actor the possibility of communicating regardless the environment or the perception of that actor, an electronic health record system affords standardizing and coordinating (Volkoff and Strong, 2017; Fayard and Weeks, 2014). With subsequent works, various ontological issues arose among ecological psychologists. Some scholars believed that affordances were properties of the environment (Turvey, 1992). Other scholars argued that affordances are relational and emergent properties of animal environment systems (Stoffregen, 2003). Chemero (2003) did not share any of the previous positions and sustained that affordances are relationships themselves between animals and situations.

Few years later, a shared understanding about this debate has been reached. Chemero and Turvey (2007) provided a common view by sustaining that affordances are relational properties of animal-environment systems and they are of the technology itself. While these ontological issues were under discussion, the theory of affordance has evolved from the animal environment systems to socio-technical systems and has been applied in other fields such as Human-Computer-Interaction (HCI) and Information Systems (IS).

The theory of affordance has been extensively studied by Norman in Human-Computer-Interaction (HCI) (1988, 1993, 1999). The author believed that people shape the affordance of an object or an environment through the way they design them. From his perspective, an affordance is "*the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used*" (Norman, 1988, p. 9). From his definition, it is possible to notice a clear distinction between affordances, which refer to the action possibilities designed in the object and the perceived affordances, which refer to the action possibilities perceived by the actor.

Norman (1999) argued that if the design of the object is done properly, the affordances and the perceived affordances should overlap because the designers create objects based on their assumptions of how that object will be used to meet users' goals. However, the assumption of designers and those of the end user sometimes differ and do not have the same interpretation of the object. Norman sustained that a solution to reduce this gap is to focus on the end-user while creating the design of a specific object in order to better meet their needs and understand their cognitive models (Norman, 1993).

The theory of affordance became increasingly popular among Information Systems (IS) scholars as they were interested in examining the relationship between digital artifacts and their interaction with organizations (Jones & Karsten, 2008; Leonardi, 2011, 2013b; Markus & Silver, 2008; Volkoff & Strong, 2013; Zammuto et al., 2007). The aim was to understand how technology affords different ways of reciprocal actions. With the application of this theory in a non-native field, new definitions and perspectives emerged. For example, Zammuto and colleagues (2007) argued that *"an affordance perspective recognizes how the materiality of an object favors, shapes, or invites, and at the same time constraints, a set of specific uses"* (p. 752). The authors analyzed the ERP possibilities and identified five affordances of organizing that emerged from the interaction between functionalities of digital artifacts and organizational contexts. They presented the affordances for visualizing the entire work processes or virtual and mass collaboration that emerged from the implementation of an ERP in an organization.

The majority of the studies applied the theory of affordance to understand the relationship between technology and organization and adopted a relational approach (Leonardi, 2011, 2013a, 2013b). The theoretical focus is on the imbrication process between humans and material agencies. The author has the aim to explain how people reconfigure material and human agencies in their routines with the help of technology to achieve certain goals. He sustained that "*depending on whether people perceive that a technology affords or constrains their goals, they make choices about how they will imbricate human and material agencies*" (Leonardi, 2011, p. 154).

A holistic approach to affordance

Hutchby (2001) and Gaver (1996) offers a holistic perspective on the theory of affordance. During the debates about ontological issues, Hutchby proposed a middle way between determinism and constructionism. He sustained that technology has "functional and relational aspects", which do not determine the range of possibilities the device actually offers. According to this view, the functionalities of technology enables and constrains actions at the same time. Moreover, he argued that affordances exist even if they are not perceived by the actors. For example, a digital platform enables actors to exchange information from multiple locations, but the potential of exchanging information exists even if these actors did not perceive it. Moreover, the author supports the relational aspect by arguing that affordances are context- and user-dependent and the same technology can have more interpretations based on the environment and those who will use it.

Gaver (1996) challenged the tendency to restrict the meaning of affordances to sociological or anthropological fields. He argued that the affordances are powerful analytical tools for "*recognizing the degree to which social activities are embedded in and shaped by the material environment*" (p. 111). His main aim was to explain the situations where "*seemingly different social behaviors*" take place in "*seemingly similar material conditions*" (Gaver, p. 112). The author studied not only individual but also social affordances and claimed that they are "*possibilities offered by the physical environment for social interaction*" (p. 114). Moreover, he suggested that when people use and make sense of their use of technology, they constantly compare it with other technologies, thus highlighting the relational dimension of affordance, this is especially true in organizations where many technologies are available.

When the idea of affordance has been translated in IS field, more elements have been added to its interpretation. In fact, its conceptualization is not valid only for individual goals and actions, but also for groups and organizations that are engaged with the coordination of actions of groups of people (Volkoff and Strong, 2013). Based on the emergence on new elements and theoretical interpretations, Volkoff and Strong defined the affordances "*as the potential for behaviors associated with achieving an immediate concrete outcome and arising from the relation between an object (e.g., an IT artifact) and a goal-oriented actor or actors*" (p. 822).

From this definition, four key aspects have been assembled together, which are the status (with reference to the potential of action), relational aspect, the connection with a concrete outcome and the application at multiple levels. In settings where technology is a critical drive for change, studies on "technology affordance" (Leonardi, 2013; Zammuto, 2007; Spagnoletti et al, 2015; Yoo et al, 2012; Faraj et al, 2011) allows to understand how and when technology "affords" change when it is implemented in a specific context.

The affordance theory has been initially conceptualized in the ecological psychology, which is a branch of science that investigates the relationship between living organisms and the environment (Gibson, 1986). The translation of this theory from its origins to other disciplines created some challenges because Gibson studied individual objects whereas the Information Systems field was more interested in studying groups of organizational actors. Such that the original theory has been extended and new definitions have been provided (Volkoff and Strong, 2017). In this study, we adopt the definition of affordance in organizations proposed by Strong and colleagues (2014), who affirmed:

> *"An affordance in the potential for behaviors associated with achieving an immediate concrete outcome and arising from the relation between an artifact and a goal-oriented actor or actors."*

Unintended consequences

Previous studies have argued that organizational change aims to achieve targeted intended consequences such as improved financial performance and increased competitiveness but it has also significant unintended outcomes (McKinley and Scherer, 2000; Harris and Ogbonna, 2002; Zheng et al, 2016; Hah and Bharadwaj, 2012). The importance of unintended consequences was recognized and acknowledged by different academic fields such as sociology (Merton, 1936; Giddens, 1984), human resource management (Harris and Ogbonna, 2002), natural sciences (Pavan-Langston and Dunkel, 1991), project management (Brown, 2000), information systems (Rodger, 1998) and decision making (Jian, 2007).

Merton (1936) has been the first sociologist, who introduced the concept of unexpected consequences and provided a general theory. The author made a clear distinction between intended and unintended consequences of purposive actions. He suggested that an actor is motivated and stimulated to make an action to achieve a targeted outcome, thus intended. On the other hand, outcomes that are not expected in advance but occur, they are considered unintended. Merton (1968) urged social scientists to investigate also unintended consequences of social action because an exclusive focus on intended outcomes limit the social explanation too much.

Although many consequences can be foreseen in advance, actors may not anticipate all the possible outcomes of an action due to five main factors (Merton, 1936; Santos and Otley, 2018). First, actors may not possess enough knowledge of a specific action (ignorance). Second, they might misapprehend present and future situations related to that action (errors). Third, they might prefer short-term benefits and do not give enough importance to long-term impacts (imperious immediacy of interest, Marton, 1936). Fourth, they might take decisions based on their fundamental values, which might justify certain actions. Fifth, actors might be influenced by preconceived ideas for making predictions (self-fulfilling prophecy). The author suggested that all of these factors can reinforce each other.

The concept of unintended consequences has also been applied in the Information Systems (IS) field through the diffusion of innovation theory (DOI) by Rodgers (1998). The author argued that the adoption of innovations may lead to intended or unintended and desirable or undesirable consequences. Several definitions have been provided for this concept such as "*a particular effect of purposive action which is different from what was wanted the moment of carrying out the act, and the want of which was a reason for carrying it out*" (Baert, 1991, p. 201) or "*not uniformly errors or mistakes: they are simply surprises that can span a spectrum from lucky to unfortunate*" (Campbell et al, 2006, p. 548).

These definitions share common assumptions that an actor carries out an action with the intention to improve the state of that situation (Santos and Otley, 2018). They acknowledge that any action will have intended and unintended consequences, which might be beneficial but also dysfunctional. Moreover, they highlight that unintended undesirable consequences might be minimized but never fully canceled. The majority of previous studies tried to provide an explanation of the undesirable unintended consequences in specific contexts (Fairhust et al, 2002; Harris and Ogbonna, 2002; Jian, 2007; MacKay and Chia, 2013; Ridder and Schrader, 2016).

According to Giddens (1979), unintended consequences are those outcomes of planned social actions that the actor does not expect in advance because they depend on the combination of internal organizational factors. In the context of our study, any result, feedback, outcome, or other technology adoption that was not initially planned in the Italian EHR implementation is considered an unintended consequence, which can be further classified as desirable or undesirable (Jian, 2007; Harris and Ogbonna, 2002).

Digital platforms

The rise of digital platforms has transformed many industries such as hospitality (Airbnb, Booking), transportation (Uber, Lyft), healthcare (Health Information Exchanges, Electronic Health Records). They are used as a new mode of organizing economic and social activities for delivering services over the last two decades. Organizations that used the affordances of digital platforms experienced a significant growth. Therefore, digital platforms are considered a promising engine of economic growth (Asadullah et al, 2018). Their increasing adoption has led to a growing interest in academic research (Kwark et al. 2017; Markus and Loebbecke 2013; Parker et al. 2017; deReuver et al, 2017).

Digital platforms have been conceptualized through two different perspectives. Some scholars defined them with a technical view (Spagnoletti et al, 2015; Ceccagnoli et al, 2012; Ghazawneh and Henfridsson 2013; Xu et al, 2010). These scholars used mainly technical terms such as "*a building block that provides an essential function to a technological system and serves as a foundation upon which complementary products, technologies, or services can be developed*" (Spagnoletti et al, 2015; Gawer, 2009), or "*a set of subsystems and interfaces that form a common structure for/from which derivative applications can be developed and distributed*" (Xu et al, 2010).

Other scholars provided non-technical definitions by focusing on the elements that enable the transactions between businesses and customers and the interactions between different groups (Tan et al. 2015; Pagani, 2013; Ye et al. 2012). For example, Pagani (2013) sustained that "*multisided platform …exists wherever a company brings together two or more distinct groups of customers (sides) that need each other in some way, and where the company builds an infrastructure (platform) that creates value by reducing distribution, transaction, and search costs incurred when these groups interact with one another*".

The benefits of digital platforms can be explained through their key characteristics. From the economic viewpoint, they significantly reduce transaction costs such as searching, contracting, monitoring and using services of intermediary actors (Pagani, 2013). Additionally, they facilitate the coordination of complimentary services through the modularity (Faraj et al, 2016), generativity (Zitttrain et al, 2006) and cross-side network effects (Yoo et al, 2012). The term generativity refers to the ability of generating new outcomes which are asked by heterogeneous users. The cross-side effect refers to the fact that the value of the platforms for a participant on one side increases as the number of participants increases on the other side. Therefore, digital platforms connect many organizations that mutually benefits from exchanging information across different categories of actors and drive the change at individual, organizational and system level (Parker et al, 2016).

METHODS

We used an inductive qualitative research methodology (Corbin and Strauss, 2008; Strauss and Corbin, 1998) to identify unintended consequences in the context of implementation of an Italian Electronic Health Record system. This method is designed for generating grand and mid-range theories while analyzing the interviews, the fieldwork and archival data (Glaser, 1978; Glaser & Strauss, 1967; Urquhart, 2007). More specifically, we use grounded theory (GT) approach, which provides a suitable framework to investigate and discover a broad explanation of unintended consequences in relation to the digital health ecosystem implementation (Barley, 1986; Leonardi, 2013). More precisely, we investigated the unintended outcomes of planned changes to the healthcare ecosystem fostered by the adoption of EHR and health mobile applications. GT methods enabled us to understand how the combination of technology, organizational structures and care actors foster intended and unintended organizational change.

There are several different approaches to grounded theory such as *Constructivist GT* (Charmaz, 2000; 2006), *Situational Analysis* (Clarke, 2005; Clarke and Friese, 2007), *Straussian* (Corbin and Strauss, 2008; Strauss and Corbin, 1998) and *Glaserian* (Glaser, 1978; 1998; Glaser and Strauss, 1967). We decided to follow *Glaserian* approach for three main reasons. First, it allows the researchers to be open to new or unintended interpretation of data, to reflect upon empirical data while combining literature, data and experience. Second, it suggests to ignore preconceived ideas to let the data tell own story (Urquhart, 2013). Lastly, the process of data analysis is conducted through a constant comparison, where every piece of data is compared with previous identified theoretical concepts. The continuous comparison between incidents, codes and categories allows the researcher to increase the level of abstraction of the data until the theory emerges (Suddaby, 2006).

In line with the recommendations of grounded theory methods, we conducted the interviews without specific theories in mind (Corbin and Straus, 1998). Our aim was to investigate the consequences of implementing a digital platform called Electronic Health Record (EHR) on multiple care actors. Before entering the research field, we studied the publicly available documents to understand how the technological infrastructure has been created, which the intended goals were and which digital services the platform was offering. We were particularly interested not only in verifying whether the expected goals have been achieved, but also to understand the unintended turns. Therefore, we reviewed the literature, highlighted the key concepts, its historical evolution and the outcomes of previous studies only after the data analysis.

The research setting

The care organizations we studied was located in a northeastern Italian region. This region created a Regional Social Health Plan in 2012 to develop organizational models of assistance and governance of activities and resources for creating synergies between the different local health and social units. The plan focuses on processes and their inter-organizational interactions and is integrated within the national program about the public health system digitization and the national EHR implementation. These digital tools were mandated by a policy reform to be introduced into local healthcare organizations.

The consortium, which is a regional research and innovation center for digital health, developed the digital infrastructure of the EHR and supported the EHR implementation in healthcare organizations across the region. Since 2007, the consortium is engaged with developing digital initiatives for regional healthcare organizations. Initially, several trials and pilot tests have been developed and tested, whereas the EHR platform was a regional endeavor that involved several parties. The consortium was the meeting point of each category of actors such as care organizations, patients, general physicians, pharmacists and the point of reference for EHR development and implementation.

An institutional initiative launched a planned technology-driven organizational change with specific objectives and intended outcomes. For example, this refers to improved quality of care, increased connectivity among care settings and care actors, the need to avoid delays and information asymmetries and to share medical information among care actors. During a five-year period, since the inception of the Regional Health Plan, many objectives of planned organizational changes have been reached; the first Regional Social Health Plan from 2012 till 2014 and later till 2016 has been prolonged for two consecutive phases.

The digital platform Electronic Health Records (EHR) created an empowering structure that allows the activation of tailored digital services for healthcare needs. It is composed of two main elements, which are technological infrastructure and mobile applications. The region through the consortium dedicated several investments for developing EHR and is planning to provide more investments for developing other digital services. Some of the care services offered through this platform are self-management of digital pharmaceutical prescriptions, personal medical history, medical prescription dematerialization, analysis of medicines consumption in relation to certain variables such as age, sex, geographical location. Electronic Health Records platform has the opportunity to create a truly integrated service delivery and can be used at all organizational levels.

We chose to investigate the unintended consequences of implementing a digital platform in the care industry because it has interesting implications for research on organizational change and technology affordance. In terms of organizational change, this setting is suitable for its complexity. Care organizations use Electronic Health Records (EHR) to support different types of actors such as general and specialized physicians, medical staff, administrators, pharmacies. Such a digital platform has been implemented in many departments, in physicians' offices and has been integrated with already existing digital tools. This resulted to be a quite complex and brought a substantial organizational change. We believe that such a complex context is suitable to study the consequences of implementing a digital platform.

In terms of technology affordance, this setting is suitable for our study because it is unclear when the expected benefits will be realized and who are those users, who will mostly experience these benefits to justify its implementation. Digital platforms have the aim of facilitating the creation, the management and the act of sharing medical data among care actors and patients. The high level idea of digital platforms is that technology affords organizational change but it is not clear the time and the activities involved in the implementation phase.

Data collection

Following the qualitative research method (Corbin and Straus, 1998), we collected data from a range of sources, such as semi-structured interviews, public documentation including internal Websites and external media publications regarding the digital tools development with related desired objectives of the experimentation project. The support of the consortium for contacting key actors played an important role and allowed us to collect different perspectives from different categories of actors. The time frame we focused on this research project is October 2017 and June 2018. We started the collection of the interviews in 2017, the implementation of this platform has been mandated by the Region and general medical physicians have been encouraged to adopt it as soon as possible with economic rewards for those who would reach a certain percentage of adoption.

Before starting the interviews, we identified a potential topic (technology-driven organizational change) and created the questions with a constant comparison approach. First, we analyzed the official documents published in regional Websites, video materials available in consortium's Website and the publicly available documents related to the development of the technological infrastructure for the Electronic Health Records (EHR). Consequently, the themes that emerged helped us to frame the direction of the first steps of the research project.

We identified different categories of care actors to interview. They are patients, general physicians, local healthcare organizations, hospitals, accredited hospitals, and representatives of the region, pharmacists, managers and/or directors of the research consortium (Table 1). The consortium provided us with the contacts of potential care actors to include in our study. We contacted the participants in advance to ask them if they were willing to share with us their experience related to EHR for the digital care services. After having contacted fifty-two care actors to interview, we collected a total number of thirty-eight respondents from patients, general physicians, IS director, ambulatory specialist doctor from accredited hospitals, pharmacists from local and hospitals pharmacies and a manager form the research consortium.

We developed an interview protocol to define the structure of the questions, an approximate time of each question, the order and the focus of the questions according to the category of the interviewees (Appendix A). Since the data collection occurred in Italy and we shared research ideas mainly in English; the protocol, questions, informed consent have been created in two languages, Italian and English. Starting from the first contact by phone with the interviewee, s/he was informed about the research project and was given the contact of the leader of the project. Before starting the interview, each of the respondents signed the informed consent forms both in Italian and in English language and two copies were given to the respondent.

Since the categories of care actors are vast and comprise different perspective of Electronic Health Records, we decided to target specific questions to each category. For example, the questions we addressed to the manager of the consortium and to the Information Systems (IS) director are different compared to those we addressed to patients, physicians and pharmacists. The questions for the respondents in charge of developing and implementing digital health programs, allowed us to collect insights about the aims and the objectives of implementing a digital platform in a region and in a healthcare organization and their consequences at a macro level. In this case, the questions were targeted at the aims, specific needs for care organizations, patients and pharmacists they wanted to satisfy, the expected consequences and the indicators of successful implementation. Whereas, the second category allowed us to collect the experience and the feedback of individual users at a micro level. In this case, the questions were targeted at their direct experience and satisfaction of the new digital tools and services.

We collected qualitative data following the grounded theory approach for an open-ended inductive theory-building research (Corbin and Strauss, 1998; Denzin and Lincoln, 2011; Burton-Jones and Volkoff, 2017). In-depth interviews were the primary data source with different categories of actors, who are using EHR for professional or care path purposes. We conducted semi-structured interviews in order to discover about the recent digital health ecosystem implementation in a northeastern Italian region (Appendix A) . In particular, we aimed at discovering the personal opinion and experience of actors involved in the experimentation project of digital health implementation on a voluntary basis.

Each interview was audio recorded and later transcribed for data analysis. A total number of thirty-eight interviews have been audio recorded and transcribed (Table 1).

Table 1 - Data collection by care actors and time

Role of Interviewee	**Total Interviews**	**Total time (h)**	**Period**
Physician	13	12	Nov-Dec 2017
Pharmacist	6	6	Nov-Dec 2017
Patient	10	9	Nov-June 2017
Ambulatory Specialist Doctor	4	4	Jan-June 2018
Local Healthcare Organizations	2	2	Jan-June 2018
Accredited Hospital	1	1	Jan-June 2018
Northeastern Region - IS Directors	1	1	Jan-June 2018
Research Centre for eHealth Innovation	1	2	Nov-Dec 2017
	38	**37**	

Source: Authors' elaboration

We recorded all interviews in a Dictaphone after having received the prior consent of the respondents. We included in this study only those interviews that we were allowed to register. During one interview, after having waited for 3 hours because the general physician had more patients to visit besides those who booked a medical appointment for that afternoon, the physician did not allow the first author to record the interview. Before fixing the interview, the respondent has been informed about the project and explicitly asked the authorization for recording the interview. This is also indicated in the consent form that each respondent received via mail before the interview. The general physician apologized but s/he changed his/her mind and did not allow to record the interview. S/he was still willing to continue the it and allowed to take notes of the answers. To be sure, s/he asked me to show the Dictaphone and check with the computer weather the first author recorded something. Although, we have taken some notes of the answers, they were difficult to analyze with a permanent record and to capture the maximum amount of answers.

There are multiple reasons for including mainly the recorded interviews in our study. First, recorded answers allowed us to consult the data when desired. This source of data can be consulted many times and the repeated listening helps to identify new venues to be explored. This was helpful to better understand participants' experiences and concerns while using Electronic Health Records. After having transcribed the types, a total number of 284 pages and 91573 words have been reached, which allowed us to identify initial insights and emerging themes. This provided a better interpretation of the data and the creation of verbal memos, which emerged from a constant comparison. The activity of recording and transcribing the interviews was a crucial component of the Grounded theory approach.

Our data collection was conducted in three phases. The first occurred between November and December 2017 with the research questions that emerged from the publicly available documents. In December 2017, we analyzed the first wave of the interviews and extracted the emerging research themes, based on which we created the second version of the questions to ask the respondents. From February till June 2018 we collected the answers from the rest of the respondents with an updated version of questions.

During the first round of interview data collection, we noticed that our respondents were not familiar with the key terms such as Electronic Health Record (EHR), Health Information Exchanges (HIE), digital pharmaceutical prescriptions or digital medical reports. The first question was *"When did you use for the first time EHR and how digital services such as medical pharmaceutical prescriptions have been introduced to you?*". Several respondents were not comfortable with these terms and asked more clarifications such as *"What do we mean with EHR and digital pharmaceutical prescriptions?".* We noticed they tended to use the description of the specific service. In our case, patients tended to use the color of the pharmaceutical prescription instead of its proper name. In the past, the medical prescription had the color red and now with the digitalization it turned to be white only in those cases when patients asked also a printed copy of the prescription. Therefore, we decided to add more information to our research object. For example, we started the interview with the question *"Which are the digital tools and digital services they use during the care path?"* or "*When did you start to use the digital pharmaceutical prescription with the white color?".*

Our field site was composed of general physicians' ambulatories and patients suggested by the interviewed physicians and pharmacists, who decided to use Electronic Health Records for managing pharmaceutical prescriptions. We included in this study also ambulatory specialist doctors, staff of local healthcare organizations and accredited hospitals, IS director and project manager of the research center of eHealth innovation (Table 1).

When we interviewed, the respondents shared their experience about the phase of entering data into a patient's electronic health record and of managing the pharmaceutical prescriptions and renews for chronic diseases. Instead, the IS director and project manager of the research center, shared their experience during the developing phase of the digital infrastructure and the consequences the care organizations were facing after the implementation phase.

Data analysis

We are investigating the technology-driven changes in care organizations therefore; we applied the theory of affordance through six principles suggested by Volkoff and Strong (2017). First, we were searching affordances, which arose from the interaction between a user and a digital artifact. Second, we made a clear distinction between affordances and their actualization, as we were interested to understand the actual configurations of behavior that created a specific action. Third, during the data analysis we focused mainly on actions and potential actions, we did not include in this study the condition reached after taking that action. Fourth, we tried to follow the same level of granularity for the affordances per each category of actors. Fifth, after having identified the affordances per each actor, we attempted to identify the salient affordances and how they interact. Last, we took into consideration the social forces, which might affect an actors' behavior.

During data collection, the research team frequently met to share and combine insider and outsider perspectives in line with grounded theory approach (Strauss and Corbin, 1998) and with prior research studies in related fields (Barley, 1986; Leonardi, 2013; Sergeeva et al, 2017; Williams and Shephered, 2016). We used NVivo as the digital tool to organize and analyze the collected qualitative data. We followed an iterative approach and involved continuous comparisons of emerging data.

Our main data analysis has four stages following the GT, which are coding, memoing, sorting, and writing (Glaser and Strauss, 1967). We applied them not in a linear way but through an iterative process since the activities of these stages tended to overlap (Pandit, 1996). Before the analysis, the interviews have been transcribed and official data published by public institutions and media have been collected. These sources were used to identify the objectives of the Regional Social Health Plan and to define how Italian EHR were actually used by different actors of the ecosystem. Next, the interviews were analyzed to identify which objectives have been reached and to understand the perception of the users related to that achieved objectives.

We proceeded with the coding according to the category of the care actors. We identified four main categories of care actors, which are patients, physicians, pharmacists and project manager/ IS director. After having transcribed the interviews, we coded them. We applied open and axial coding. For the data analysis, we used the NVivo software package to track the codes.

We assigned one or more codes to capture the main thoughts and experiences of each respondent. Some categories such as patients gathered less categories because the key concepts were similar, instead project manager and general physicians shared more ideas and information therefore we assigned more categories. We created the code labels based on the key words used by the interviewees. With the emergence of many codes, we created trees of codes and compared them in each stage to create more abstract concepts.

In the stage of open coding, we used mainly the vocabulary of the respondents, the so-called “in vivo codes”, such as “red prescription”, avoid long queues in ambulatories”, “receive the prescription on the mobile device”. Each interview was coded based on the interpretation of the words and the intentions of the respondents. In the open coding stage, we created 57 codes to capture the first set of concepts.

Next, we proceeded with axial coding when we started to discover the emergence of a phenomenon (a category). We followed Glaser’s recommendations to use axial coding when we uncovered a phenomena of interest from the data and continued to code around a core category (Glaser, 1998). Our code list was composed of 167 codes for two main reasons. First, we tried to capture the concepts as broad as possible because we wanted to understand technology driven organizational changes and their consequences on care actors. Second, we did a detailed coding to be able to make constant comparisons among the codes and stages.

Memoing helped us to propose abstract concepts and discover potential relationships among them. The memos helped us not only to compare codes but also to critique our ideas in each stage and to compare them across time. They help to add more insights and to explain more in detail what is emerging from the data. Moreover, they helped us to recall initial thoughts and overarching context that were not said during the interviews but were perceived. Throughout the study, memoing was written in English based on the research theme discussions.

The number of written memos increased, so we started to sort them based on the ideas that started to explain the data. Consequently, we proceeded with writing our interpretation of the data and tell the story of this study that emerged from the interviews and the documents collected.

Finally, we uncovered the consequences of the EHR implementation within the northeastern Italian region. To do so, we coded all desired objectives from different actors’ perspectives and the reached goals of the planned actions of the regional project. We continuously compared the qualitative data for uncovering the consequences (both intended and unintended) of planned actions within the health context and to discover how these unintended results influenced the interviewees.

RESULTS

In this section, we present the results from the data we analyzed. First, we explain the EHR components and its main objectives and tell the clinical needs from which this project initiated. Next, we show the intended consequences by care actors. We proceed with presenting the most important unintended consequences emerged from our study.

Electronic Health Record implementation and its objectives

The Regional Social Health Plan had a detailed explanation of the key components of the Electronic Health Records and which were its intermediate and macro objectives (Appendix B Table B 1). These are three main categories of the components that are minimum core (i.e. administrative data of the patient, pharmaceutical dossier), supplementary documents (i.e. prescriptions, vaccinations, medical certificates and others) and security and privacy protection (i.e. informed consent for consulting, exchanging and updating personal medical data). Each of the three categories had intermediate objectives to be achieved. For example, the minimum core has the aim of providing a unified and comprehensive view of the patients' health status. Moreover, the goal of supplementary documents is to avoid delays and information asymmetries while delivering care services. Overall, the EHR platform and mobile health applications that have four macro objectives: connect the different patient care settings; provide patients with access to their data and information; provide a useful source of information for the planning, monitoring and evaluation of the healthcare system; and improve the quality of care processes, services and reduce costs.

Clinical needs leading the Electronic Health Record implementation

Before we get into the intended and unintended consequences of the EHR implementation, we briefly discuss how the EHR implementation started. The consortium, which is a research and innovation center for digital health, was in charge to develop initiatives for promoting digital health. Its aim is to facilitate the implementation of a digital platform in care organizations to collect, share, update and consult medical information. Surprisingly, the EHR project was not a bureaucratic necessity, instead it emerged from a clinical need from cardiologists, radiologists whose profession is technology dependent. For example, Radiology Information Systems (RIS) not only improve the diagnosis but also afford an immediate visibility of images and collect information of patients' health status. However, at that time, the storage of this information was blurred. In the sense that it was stored in the machines used for the diagnosis and given back to the suppliers when they replaced the new machines.

> *"This [medical]information is very valuable but unfortunately it was of the property of private suppliers, companies that supplied these machines. Slowly the information systems of the care organizations that have become Complex Organizational Units have acquired the hardware and software technology (disk space or other things to collect those data that these diagnostic machines produced). In this way doctors could have the data of the machines related to the patient who were there before."* (Project Manager)

Official rules emerged later to regulate the procedures of medical information digitalization where to store them. The exchange of medical information between the suppliers of the diagnosis machines and specialized physicians was very dynamic but at the same time privacy and security standards were not respected not for their will but because of knowledge lack and these standards at that time were not available yet. With the increase of the amount of the information exchanged, arose the need of creating a digital archive of medical information.

> *"Obviously the main reason was the clinical one and at that time, there were no other reasons. So it was enough for the clinic to be able to properly handle the information that these business systems were processing."* (Project Manager)

The intended consequences of Electronic Health Records implementation

We first discuss the intended followed by the unintended consequences per each type of actors. These categories and representative data for each type of actor is presented in Table C1. Going to the expectations of care actors who started to use this digital tool, the majority of the patients were familiar with it, but they did not recognize the official terminology. They tended to use the new color of the medical prescription, which changed from red (Appendix B Figure B1) (provided by national care authorities) to white, which refers to the digital prescription that upon request can be printed (Appendix B Figure B2).

The majority of the respondents were well informed about the time of implementation and also about some time frames when the implementation stopped. The majority regardless the category of the respondents confirmed that they started to use Electronic Health Records in 2015 and remember that their use stopped or was problematic in 2017. That specific year general physicians went on strike because some of the agreements between care organizations, managers at regional level and physicians have not been respected.

Electronic Health Records and mobile apps have been introduced to physicians during official meetings with care organizations, during national conferences organized by the region, during specialized conferences for physicians, pharmacists. The project managers in charge of the EHR development clearly informed us that regular workshops and training courses have been delivered to each care actor to teach them how to use it. However, during the interviews, several physicians stated that they were left alone during the implementation and the learning phase, even the agreed economic incentives have not been totally delivered to each physician as agreed previously.

> *"They [the developers of the digital platform] always say that the platform is very easy and intuitive to use. And I agree with it, it is intuitive but only when you know how to use it and understand its mechanism. Sincerely, I learned by myself how to use it in everyday tasks. For example, some aspects of the EHR and features I*

> *discovered them only several months later while discussing with other colleagues or while solving technical issues."* (Physician 5)

Intended consequences for general physicians

Updated medical information

General physicians had many expectations from the introduction of this digital platform in their daily tasks. Their answers focused mainly on positive expectations and they thought that it would facilitate their job. The most mentioned consequences are the following: considerable time savings, have less patients in physicians' surgery, have more time to visit the patients, continuous availability of medical information especially in emergency cases, easy and functional tool to use, assuring transparency of the access to data, reliable and security data.

The Electronic Health Records were perceived as a facilitator for bureaucratic purposes, repetitive actions and for having access to medical data. Two main affordances emerged from the data: *enhancing and expanding* care actors' memory and *freeing* them from bureaucratic burden.

> *"I can check the history of my patients any time and monitor it. For example, often happens that patients make specialized visits and then they do not bring the results of the visit to me. Then after several months they come to me and ask another prescription for the same reason because they forgot about it. So I can check when a visit has been made and then monitor the results, ask the patients to bring the results of the visit or download it from the care organization platform." (Physician 3)*

Increased delegation in shared outpatient clinic

With the introduction of EHR in outpatient clinics, general physicians had the opportunity to delegate some tasks to their colleagues during their absence in order to offer a continuity of care during when a physician substitutes the other. Additionally, the role of the secretary gained more relevance and required more competence. An increased delegation of tasks to other workers in an outpatient clinic improves the attention a physician can give to each patient, thus increasing the quality of care.

> *"Our secretary's job is much more dynamic then before. S/he has more tasks and responsibility to do and this also increases her role here. For example, our secretaries prepare the medical prescriptions with the platform and when I have few minutes I check them and confirm or cancel. This is not only useful for us as care providers but also for the patients, they do not wait until I will finish the medical visits to give them the prescription." (Physician 3)*

Easy of use

Since the inception of the platform and of the mobile health app, the developers tried to create a platform easy to use and very intuitive as a way to facilitate the work of care professionals and the use for patients. Therefore, they followed multiple steps before delivering the last version of the digital tools and this has been witnessed and confirmed several times. However, beside the easiness, there is the component of learning and knowing what to do with it.

> *"They [the developers of the digital platform] always say that the platform is very easy and intuitive to use. And I agree with it, it is intuitive but only when you know how to use it and understand its mechanism. Sincerely, I learned by myself how to use it in everyday tasks. For example, some aspects of the EHR and feature I discovered them only several months later while discussing with other colleagues or while solving technical issues." (Physician 3)*

Improved and tracked decision making

Tracking each activity and choice taken together with the patients, offers many advantages for the future. For example, the physician can assess the number of patients with a specific disease, can have a more complete information of the patients care path. In this case, even if the patient might come for a visit after years, the physician can have an immediate access to patient's information and support him/her again.

> *"These instruments allowed me to improve the organization in my clinic and definitely have allowed me to automate situations which before required different type of work..." (Physician 7)*

Intended consequences for pharmacists

Pharmacists were supportive of this innovation but at the same time they were not sure whether all care actors involved were digitally ready for this transformation. One of the themes that emerged during all interviews, was the costs they were asked to cover to be able to work with the new digital devices. First, they need to update their Internet connection, have more computer positions to manage new information from the patients, have new scanners to read the medical prescriptions.

The main expectations are the following: decreasing the operating time of the pharmacy, shortening bureaucratic passages for filling in the medicine, following patients' therapy and treatment path, consulting the pharmaceutical dossier, being a citizens' health controller and creating a digital recipe register for burning blanks used by pharmacists for payment from healthcare local organizations.

The consequences experienced by pharmacists after having implemented EHR are differentiation on service quality, professional recognition and business innovation.

Differentiation on service quality

Several pharmacists saw in EHR as an opportunity to improve the quality of the service they deliver to patients. They were aware of the challenges to implement it but they focused especially on the positive outcomes. Indeed, pharmacists explained that in the initial phase consulting information in patients’ medical cards required some time especially when the system did not work but sometime later, they started to appreciate the opportunity to spend more time with the patient and have a chat during the payment because all the information was already inserted by the general physician.

> *"Now we will focus mainly on the preferences of the patients and how to make feel them better. In this way patients will come back to us and we will differentiate our self as recognized professionals, as quality service providers." (Pharmacy 2)*

Professional recognition

An interesting theme emerged from the interviews with physicians refer to their role in the care system. They believe that the pharmacy is not only a passive provider of the medicines for the patients but they perceive themselves as an active healthcare institution in the regional system. Therefore, pharmacists expect Electronic Health Records afford them to recognizing and enhancing their profession at regional level.

> *“I don’t want to brag but I was one of those who coined this term “zero km” pharmacy, so we are recognized both by citizens but also by public institutions as a determining element on the territory also valuing our profession. This was one of the first steps to determine the value and even enhance the role of pharmacy in the territory and the health system of the region”. (Pharmacist 1)*

Business Innovation

Besides the costs each pharmacist had to bear for adapting to the new tools, they highlighted also some of them highlighted the fact that this mandated technological change encouraged them also to foster a business innovation since the new digital tools required some work and competence changes to offer a better service to the patients.

> *"Now we are asked to update all our technological infrastructures, which is positive for the entire process and of the digitalization. In fact, this involves other changes and raises requirements. I bought new computers, enhanced my Internet connection, integrated new operation systems for being part of the information systems of the public care service. This inevitably brings to an innovation also in our business, internal organization and the quality of the services we offer. But at the same time, these requirements are very expensive and we have to cover them without any public help. (Pharmacist 4)*

Intended consequences for patients

Quality based choice

One of the most frequent themes among patients was the opportunity to go to the pharmacist they preferred and not mainly to the one close to their general physician because of the proximity and time constraints. Now, since they can receive the medical prescriptions online, they can fill their medicine to the closest pharmacist based on their location and working activities. Patients started to choose the pharmacists who were more competent and nice with them.

> *"...before I had to go always to the same pharmacist, every time I felt mistreated, plus I had to go on specific time. Now with the digital pharmaceutical prescriptions, I can go to the pharmacist close to my job when I finish and I feel I am real client treated properly." (Patient 4)*

Expanded memory

With a tracked system and continuous update of their medical information, patients felt more self-confident because they could consult their information at any time and plan their activities accordingly. They appreciated the fact that they can see the name of the medicine, the time and diagnose they see on their smart phone. It is useful also when they chat with their family and give them concrete and detailed information about their medical visits even if time passed.

> *"In the past I tended to forget the paper prescription and when I went to the pharmacy, I could not fill in the medicine. You know I have a certain age. Or sometimes I took just one prescription when I had to take other two with me because I have more than one chronic disease. So I had to go home to take them but maybe in another day when I was less busy. Instead now, I have always this information with me with the phone or with the medical card." (Patient 2)*

Time flexibility

Electronic Health Records afford patients to filling the medicine in the pharmacy they prefer, skipping long queues for the medical prescription, self-managing their time for treating chronic diseases, consulting their historical care path, receiving the results of medical visits at home, spending more time with their family to learn how to use the new digital services for their care path. Patients were enthusiastic about the possibility to avoid medical visits just for administrative purposes such as receiving medicine prescriptions.

> *"You know, I am a grandma' and I have four grandchildren to take care of. But you, I am also old and have some chronic diseases unfortunately so I have to take the medicines every day. It is so difficult sometimes to come to visit the doctor and have the medical prescription because my children work the entire day and they cannot stay with their babies in the afternoon, so I help them. But who helps me with the medical prescription? Now there is the white paper, I don't need to visit my physician so often. At the end that medicines are always the same."* (Patient 4).

Feeling empowered

Patients expressed a positive opinion regarding their proactive role in their care path. Even if they were having health problems they felt more empowered because they were aware of the process they were following and they understood that their attitude and approach is very important in this process.

> *"I am more active now, at the beginning it was a bit difficult because to learn and follow all that steps but then I felt the difference. I can make decisions with my general physician, I follow the steps with more involvement. If I missed some time to the take the medicine, I blame myself and better understand how important this is." (Patient 6)*

The intended consequences for the Information Systems directors and project managers corresponds to the intermediate and macro objectives of Electronic Health Records implementation (Appendix Table A).

The unintended consequences of Electronic Health Records implementation

Unintended consequences for general physicians

After having identified the intended outcomes of EHR implementation, we enlarged the picture of the northeastern Italian region by investigating also the intended consequences experienced by the four categories of actors. The most important unintended consequences experienced by general physicians are increased workload, abuse of empowered patients' role, information privacy concerns, increased costs for digital services and over and above digital platforms and apps.

Increased workload

The benefits presented to general physicians before the implementation of EHR in their outpatient clinic convinced them to collect the legal authorization from their patients and to use this tool to improve the quality of the care service they delivered. However, a theme that emerged from the interviews with all general physicians was the increased workload. They did not expect at all that it would require such an investment in terms of time and knowledge required to use it. On the contrary, they were expecting to facilitate all the steps of the data collection and sharing in order to have more time to dedicate to their patients.

> *"This platform has been introduced in our work to facilitate our lives, right? Many positive aspects have been highlighted during the presentation but no one informed us about the increased workload. It was too much, you know we have to collect the informed consents, we have to explain patients how to use it, how it works, we have to solve technical problems. I didn't expect it. The positive effects come much later then the increased requests we received. And almost nothing in exchange." (Physician 5)*

Abuse of empowered patients' role

The majority of the general physicians were expecting to develop a more positive relationship with their patients since they could dedicate more time and develop a better physician-patient relationship.

However, they did not foresee that the patients would behave as a controller of the working activity of their general physicians.

> *"I agree to improve the role of the patient and make him/her more active and aware of the entire process. This is right and is part of his/her life, but now they are exceeding with pretentions and continuous controls on my work as physician after 30 years I treated them. For example, it was December 24, it was my turn in ambulatory and I receive a phone call on my personal phone because I gave it only for emergency cases to give more support and I receive a call where the patient informed me that I have to prescribe him/her the medicine in time otherwise he/she will be out of scheduled deadlines. His/her medicine for chronic disease was fine and only in 2 weeks s/he would need the new prescription. I informed him/her about this and s/he said with holidays break you never know." (Physician 11)*

Information Privacy concerns

After several weeks of brainstorming and mutual agreements, general physicians and the northeastern region, the promotion of the EHR implementation started with the collection of legal authorization by general physicians, who is the first contact point of the patients therefore the closest care actor to the patients. It was not expected that this activity would create the difficulties it created. Since there were no official rules related to the information privacy of the patients who would use the EHR, general physicians stopped to collect the legal authorization from patients. This slowed the EHR implementation across the region.

> *“So if before the prescription [forms] were given to me by the state now instead I pay for it... I underline that at the beginning there was still support from the region regarding the expenses. Now however the expenses again I have to sustain by myself ... it is a marginal aspect but nevertheless I have to work for something that then I have to pay” (Physician 4)*

Increased costs for digital devices

Part of the agreement between general physicians and the northeastern region referred to the economic incentives for the promotion of the tool among their patients and some economic support for the digital infrastructure to cover the expenses of implementation. However, the majority of the physicians highlighted the fact that the economic support they received did not cover the expenses they faced and the agreement has not been respected.

> *"....you know, I had to pay everything by myself even if I did not support this initiative sincerely. It seems not very organized. At the begging we were offered some incentives, but then everything was on my on my budget. If tomorrow they (the region) will implement another one, should I cover again other costs with my budget?" (Physician 8)*

Over and above digital platforms and apps

We found a bottom-up reorganization process to reduce various steps and accustoming patients to follow the same (standard) process. The new digital system increased the back office work, but saved time to visit patients and now they can provide more qualitative answers. They spend more time in updating and uploading medical information but this compensates the final outcome: ability to prescribe more aware and complete medical treatments. They are delegating the bureaucratic work to the secretary, empowering his/her role (in the past s/he was delegated just to manage the agenda).

> *"The work of the secretary has changed in a positive sense. Before [the EHR] she was delivering papers and papers to patients and for each paper [medical prescriptions] she needed to wait my physical signature. Now instead the work of the secretary is more fluent, probably more complex but in a satisfactory way. Now, s/he can prepare the digital medical prescription and when I have a bit of time I sign it digitally and she can deliver it to the patient so the patient is not forced anymore to wait for a simple medical prescription." (Physician 9)*

For introducing the Electronic Health Records in patients' life a legal authorization for the privacy and security is mandatory. Each patient can activate the regional Electronic Health Record for him/herself, his/her minor children or a person whose legal guardian is the citizen that applies for this procedure. The consent to the personal EHR is composed of three intermediate phases:

a) Consent to the feeding of information in your health record (all data and documents produced by the Health System will be accessible to the patient).
b) Consent to consultation of the health record (allows authorized persons to have access to these data and documents for treatment purposes and for only such time as is necessary to implement the health path)
c) Consent to the feeding of the health record with previous data and documents (allows the citizen and authorized persons who will take care of the person concerned to have immediate access, through access to the EHR, to the patient's medical history so as to have a complete clinical picture).

Then the patient has to follow the instructions received via email and mobile phone. Multiple steps are involved to create the personal identity on the digital platform.

In this phase, we noticed a bifurcation of general physicians' behavior. The supporters of the digital initiatives in care, did their best to help their patients in completing this process and to teach them how to use it in a meaningful way. This category experienced the enthusiasm of the patients for having facilitated their life especially for those patients between 50 and 60 years.

The physicians who supported this initiative pretended more benefits from the EHR platform. Although several technical, privacy and security issues have arisen, they were still interested in achieving the full implementation and experience the full package of the promises of Electronic Health Records. During the collection of the informed consents form the patients, a general physician stated:

> *"Sincerely, I believe in the benefits of these digital records, so when I introduced this initiative to my patients I reached almost 100% of signatures within 3 months. I know some colleagues reached other percentages. But, if my patients would refuse this opportunity I was ready to ask them if they were still interested in being my patients and if they still believe in my medical abilities." (General physician 10).*

However, the same physician was also pretty disappointed from the slow time of implementation at the regional level and for the slow path to experience the entire potential of the EHR. The respondent clearly said:

> *"I can understand some slow implementation and other issues, but I cannot believe that the EHR is just the digital collection of medical information. I refuse to believe in this. It is inadmissible. I need to see more from this digital initiative."* (General physician 10).

We categorized as inhibitors of EHR those physicians, who did not support this initiative. However, initially they were not directly involved in their implementation, but with the time the use of digital services spread among many patients. Those patients, who yet did not give the consent to create their identity on the EHR platform, started to request or better say pretend this service to their general physicians until they did not accept it.

> *"You know that at the beginning my mother had the EHR but I did not because I have another general physician and he doesn't like the technology. After a while I started to ask him every time when I could start to use the EHR because I said him: my mother, who is older has it and I don't. I also want to avoid long queues in your ambulatory. After some months he finally listened to me and started to use EHR. I think I had an impact on his choice."* (Patient 6)

After two years of experimentation with the Electronic Health Records, the privacy and security issues are persisting. Especially the supporters of EHR were particularly disappointed from this issue. They could have understood in the first months because it is something new, but after two years the same issues remain unfortunately unresolved. They were not able to understand the reasons for such a long time without having results from the region. Also because this challenge slows the implementation of a project, which is showing positive results.

> *At the beginning of the project there were some privacy and security concerns, after two years of implementation there are even more problems related to the privacy and none is taking a position. I would never have thought that this problem could last that long, and probably it will further continue. Sincerely, this is unbelievable.* (Physician 4)

Although the aim of digital services for patients is to increase their reach as much as possible, under some conditions it happens the opposite and fosters the digital divide. Some patients asked help to their family or friends to learn how to use the new digital tools so they appreciated more interactions with their family. However, some patients, who do not have a family or friends to ask help, their loneliness is augmented. Almost all general physicians raised this issue and they were surprised that no initiatives have been organized for this segment of patients. Physicians explained to these patients how to use the EHR but it is new information and it takes time to master it.

> *I have several patients who are totally alone and they do not know how to use these digital tools. I explained them a bit but when they are alone and don't remember the sequences to follow, they were blocked and did not continue the request or example. So they came to my office and lost the benefits of the digital technology. This can happen, but how is it possible that no one from the region thought about them and how is it possible that they did not do anything to include these patients in the digital process. It would be enough to give them some social workers.* (Physician 9)

Many general physicians claimed the necessity of consulting the results of specialized medical visits from the information systems of the hospitals. They were bothered by the fact that they were asked to disclose precious information about their patients with many care actors such as with hospitals, but they were not allowed to consult medical data from hospitals' digital platforms. This seems to be unusual and odd but understandable because general physicians were sharing information with hospitals, but the opposite was not occurring because only specialized physicians of that specific hospitals have access to that platforms.

> *I cannot understand why we have to have the burden of collecting informed consent from our patients, spend lots of time to input, update and correct medical data on this [EHR] platform, and to see the same information we are seeing now from our private digital records. Why we cannot have access to the platforms of the hospitals were they store the results of their visits? Are we doctors of another level? This makes me even more disappointed.* (Physician 8)

Unintended consequences for pharmacists

The unintended consequences experienced by pharmacists were increased costs for digital devices, technical malfunction of the digital platform, Lack of data access at patients' pharmaceutical dossier and abuse of patients' empowerment.

Increased costs for digital devices

Pharmacists try to updated their activity and improve their knowledge while delivering care products to their clients (patients). They believe that the innovation and improved service creates more opportunity to remain on the market and retain their clients. However, the need for continuous innovation and the need to have operating systems in line with those from public healthcare organizations is more expensive they were expecting. One of their concerns refer to the frequency of advanced technologies implementation.

> *"I support the innovation in our profession, the use of digital tools to facilitate our job and improve the performance but on the other side, this is very expensive. I mean, I bought two extra computers, improved the Internet connection, higher costs for the new software and all of this only at our expensive. If in 2 years, new platforms will be implemented we will have to face similar economic expensive." (Pharmacist 6)*

Technical malfunction of the digital platform

The pharmacists were aware of some sudden technical malfunction of the platform, which is something that can happen especially in the initial phase. However, they highlighted the fact that these malfunctions were too frequent and they were not able to do anything because these issues can be solved only by the developers of the platform. One of their major concerns were the fact that this was decreasing the quality of their service for the patients.

> *"…there have been cases of doctors who do not send - but for different reasons - the prescriptions. In that case [the patients] were coming to the pharmacies with a code and asked to download from us - something that among other things we cannot do because it is violation of privacy". (Pharmacist 3)*

Lack of data access at patients' pharmaceutical dossier

Pharmacists do not sell only medicine but they give also some suggestions to patients related to the brand of the medicine, based also on their allergies or preferences. Therefore, they offer more than a purchase but also suggestions and emotional support. They highlighted the fact that they would like to have access to the pharmaceutical dossier of the patients in order to track the choices of the clients and further improve their suggestions.

> *"The software of different pharmacies cannot communicate with each other due to privacy issues. In fact, the Electronic Health Record is the electronic file with the patient's health data, which the patient carries with herself and which she can retrieve with her health card. I cannot communicate patient data to other pharmacies we have constraints and we have to be very careful about them and it is also right that this is the case". (Pharmacist 1)*

Abuse of patients' empowerment

Pharmacists were supportive of the Electronic Health Record and the digital medical prescriptions. Some of them were part of pharmaceutical associations, which are involved in the creation of digital services for patients in collaboration with care organizations. For example, one pharmacist proposed the name for a mobile app to self-manage the pharmaceutical prescriptions. Although their enthusiasm, pharmacists stated that they (multiple care actors) were in the middle phase between paper and digital system.

The process of managing medical information is complex because it requires many steps and involves many actors. Now, the region is digitizing some paths but there are still parts which are totally performed on paper. For example, the codes on the medicine provided by the public care organizations are still on paper and pharmacists have to read the barcodes to deliver it to the patient. The medical prescription is available in digital format but the barcodes management is still paper based. This diminishes the benefits of the digital affordances.

> "*When I deliver the medicine to the patients I see their prescription from their phones or medical cards but I send the barcodes to the Ministry of Economy for the reimbursement by post. This is funny because I could do this digitally*." (Pharmacist 2)

The technical requirements of the new information systems are expensive to satisfy and pharmacists, who would like to continue their activity are asked to cover these expenses with their budget. Higher investments in technological infrastructure are mandatory to have safe and secure devices.

> *"It was complex to integrate our operating systems with the digital pharmaceutical prescriptions, especially at the beginning. I had to buy two new computers for the back office, change the internet connection for a quicker one."* (Pharmacist 4)

The Electronic Health Record and mobile health applications are artifacts that are provided and monitored by central administration offices, and based on policy guidelines. We found two effects: diminishing the professional error, i.e. the systems inform you when the data is incorrect, standardizing data entry, dispensing medicines without waste (cost cutting) and purchasing them with the utmost precision.

> *"Sometimes it happened that a physician prescribed a nonexistent stuff because he wrongly wrote it or it was almost illegible or the doctor prescribed on the same prescription two things that could not be together. I guess that from an electronic point of view at least there is the readability of the prescription, this professional error will not happen, because when you prescribe you have to select a specific item."* (Interview 2 - Pharmacist)

Unintended consequences for patients

Besides the intended consequences each patient shared during the interviews, after some reflections, they expressed also the unintended consequences such as digital literacy requirements, multiple login accounts, family and/or legal guardian dependence and complex (long) digital profile generation.

Digital literacy requirements

Their general physicians promoted the EHR to have a better healthcare service, they agreed to use it and they had some difficulties related to the digital literacy. They confirmed that the platform was intuitive to use but only after having developed this intuition through some guidance of their family members.

> *"...I am not young you know, I have my age and all this technology is good but I don't know how to use it. Especially at the beginning. So I asked to my granddaughter and she helped me. But then after some time I forget it so I ask her again. I like it so I can also spend some time with her. But a friend of mine is alone, so she doesn't know how to do so I help her only for what I remember eh. (Patient 5)*

Multiple login accounts

The patients did their best to use the platform and ask to their general physician in case of need, but they experienced some challenges related to the multiple login accounts. Specifically, they highlighted the fact that they had to login continuously to the platform without having the opportunity to save the password one time for a long time and this disturbed their experience even if they understand this was necessary to preserve their privacy.

> *"There are so many passwords to remember. It is too much if I remember my birthday. I write the passwords on a paper but if I am out and I need to download something I cannot do it because of this. This is bothering. There are too many accesses to do before receiving that information." (Patient 3)*

Family and/or legal guardian dependence

Patients expressed their need to conduct a lifestyle as independent as possible even if they had some health issues. Instead the digital platform created a kind of dependence with their general physician, family or legal guardian when they did not know how to use it. This was particularly frustrating for those patients who did not have a family to ask support.

> *"When my physician explained me how to use it, it was fine it seemed so easy. Then I came back home and I tried but it did not work. I did not remember at all. So I asked to my daughter, she is young you know so she helped me but if I didn't have her what could I do? I should have gone back to my physician or to the secretary. I felt very dependent and this is a problem for me because I always tried to be as independent as possible but this is difficult." (Patient 2)*

Complex (long) digital profile generation

The patient is more empowered and has more control over personal care as they can choose to give the consent to physician to share their medical records. The family doctor, that was the main front end for the patient, now is bound to share information and has no access to the whole system of information. So in the chain of service delivery potentially s/he can lose power and reputation.

Moreover, pharmacists experienced a higher professional interchangeability and are more prone to collaborate.

> *"Before being able to use the EHR, it was a pretty long process at the beginning I mean. I had to give my mail and then create my profile, with all my personal data eh. But he [physicians] explained me that this is for my privacy, only doctors to whom I give my consensus can see my illness (laughing). Now I am more aware of the entire process."* (Interview 6 - Patient)

The new digital services increased the velocity of providing medical information when patients requested it. The majority of patients were aware of some benefits such as continuous availability of their medical information, facilitation to complete tasks, diminished times to complete a task. However, they did not expect to experience directly these benefits and to solve the waiting time for receiving a medical prescription.

> *"The first time when I received the prescription on my phone I thought I was in the future (laughing). My physician explained it to me but I did not expect to have so many facilitations when the system works. Because sometimes everything is blocked and I have to do all the steps again in another day." (Patient 5)*

The feel of having continuous care services also during holidays has been highly appreciated by the patients. Having the opportunity to fill in the medicine from the holiday location is an unintended outcome that patients would have not even imagine.

> *"Now I can take the medicine from the pharmacy close to my apartment at the seaside. Before I was always anxious about my medicine because it can break during the travel and I had to come back home once in the past. But now I feel totally safe because in case of a problem I can ask my physician a new prescription and fill in here without going back home.*" (Patient 9)

The use of mobile device to consult information increases the mobility and freedom of patients during their care path. Initially it took time to learn how to use the applications but later the benefits compensated their higher engagement. Continuous updates of the mobile applications used mobile memory and created some confusion in patients, which has not been anticipated by them.

> *"Now I can consult all my information from my phone, it is so comfortable. But they ask continuous updates on my mobile device and this bothers me so much. I understand this happens with all applications but so often, I think it is too much".* (Patient 3)

Unintended consequences for EHR managers

The managers and directors who participated to the development and implementation phase of the EHR platform collected some outcomes that they did not expect in advance otherwise they would have planned some possible solutions to the emerged issues. The most important issues were excessive care actors' resistance, Information Privacy concerns, long implementation time, Generation digital divide.

Excessive care actors' resistance

The team who implemented the digital platform across healthcare organization were aware that some actors would have refused to use the platforms, but they did not expect that this resistance would have been so strong and would impact that much the EHR implementation.

> *"For the fact that this digital initiative has been created, developed in collaboration with direct end-users, I would never expect such a resistance from some care actors especially. Several strickes, confirmations and continuous disconfirmations, after so much work." (IS director)*

Information Privacy concerns

Another issue emerged across the four categories of care actors refer to the information privacy concerns. However, some activities have been done much in advance in case of necessity with general physicians. Indeed, the agreement has been reached the implementation phase started. However, they did not expect that at the certain point this issues would have been used as topic for striking.

> *"The issue with information privacy is pretty long and complex. We took this into consideration even before and several activities have been done from the beginning. But we would not expect that initially some care actors would support the collection of informed consents, which also highlights their role in this initiative. The same actors later changed their mind and did not collect them anymore." (Director)*

Long implementation time

"The introduction of digital technologies in care organizations have always took some time, but after a while it started to bring its results. In this case, several challenges have arosen since the project started. Although the goals, the aims and the obtained results are positive, the implementation time is long and much work has to be done. We started now to collect the consents also in care organizations to free general physicians of this duty and foster further its use." (Project Manager)

Generation digital divide

The implementation of Electronic Health Record is mandated by the region and developed by a consortium. The directors and managers in charge of this initiative, created a well-defined plan with clear objectives to reach, as a precondition to go to the next step of the entire project. They were aware of some challenges; however, some consequences were not anticipated in advance. The digital platform aims to improve the information exchange during the care path but this occurs to those actors who are able to use it. Whereas, those patients who do not have access or literacy to digital tools are totally excluded from the ecosystem, thus highlighting the divide between digital and non-digital patients. More social support is need to fill this gap.

> *"Many initiatives have been created to facilitate the introduction of these platforms in care routines, but more work has to be done for those categories of patients who are alone without a family support. More social support has to be offered also for patients who are guided only by legal guardian." (Director)*

IMPLICATIONS FOR THEORY AND PRACTICE

This study has both theoretical and practical implications. For scholars, this qualitative analysis provides a valuable perspective to conduct new research projects about advanced technologies implementations in different healthcare organizations and with diverse care actors to provide a more comprehensive perspective. The implementation process of advanced technologies in care settings is still progressing, so this study can be used as a reference point for future scholars who will investigate this phenomenon. Additionally, we presented several challenges faced during the data collection and analysis, which may warn for future research. The limitations of this project can be used for future research during the selection of the phenomenon to investigate, the methodology and the most suitable theoretical perspective.

For practitioners, this study can support them during the implementation process by focusing not only on the intended and achieved goals but also on the unintended outcomes. This is particularly important because it provides a more comprehensive perspective and help practitioners to recognize the problematic issues and their source. Specifically, understanding the impact of different categories of actors on EHR implementation can help practitioners in understating different sources of problems with relative resolutions and in determining interventions to achieve better outcomes. Peripheral actors play an important role in the creating rigorous and truthful medical information, which will be used by other care actors. Therefore, their involvement and recognition might improve the level of implementation. Moreover, our study highlighted that if core care actors do not foster the EHR implementation across their patients, this can be minimized by transferring some of their activities to peripheral actors to ensure a continuous implementation until the final goal will be reached.

STUDY LIMITATIONS AND FUTURE RESEARCH

This study has several limitations which create new opportunities for future research. First, the findings are based only on northeastern Italian healthcare services and organizations. The analysis of data from other regions or countries could provide different insights because of different legal systems, types of organizations and privacy constraints. A comparison between two or more countries or regions engaged with digital technologies implementation in care settings will enrich current understanding of challenges and strategies used across countries or regions. Hence, a research opportunity might be a comparative study of the factors impacting the implementation on EHR and its consequences.

Second, even if we collected information from different categories of actors that had been using the platform in different ways for different purposes, the perspective provided is still incomplete because we did not include also peripheral actors that daily use EHR platform such as administrative operators, centers for booking medical visits operators and we did not include many medical departments or units such as first aid, radiology, cardiology. A more comprehensive picture could be obtained by including more departments, agencies and government.

Third, in this study we collected information about perceived technology-driven change of different care actors, but we did not formally measure the identified changes on the digital platform. Quantitative insights from mixed-methods research could complement the findings identified in this study. Moreover, the privacy concerns issue played an important role during the implementation and use phases. Hence, a quantitative study on the perception of direct users about this aspect might provide valuable insights to foster the implementation level further.

Fourth, we focused mainly on two elements of the digital platform, which are EHR and mobile health apps due to the availability of data. However, the Health Information Exchange platforms contain many more services and tools to include and analyze in relation with EHR and mobile apps because the mutual influence might increase the understanding of the results achieve. In the long run, service delivery practice will entail more digital tools, whose impact will have consequences on the entire digital health ecosystem.

CONCLUSIONS

This study contributes to the affordance theory and unintended consequences by deepening our understanding of the role of digital platforms in changing the ways care services are delivered. First, we examined a case study comprehensively as we interviewed different types of care actors, who used different services offered by the Electronic Health Records for different lengths of time and purposes. Moreover, we considered also external stakeholders who indirectly used the platform to deliver specific care services such as pharmacists. Second, we organize and categorize the unintended consequences into four distinct groups. This helps policymakers to understand and to minimize the dysfunctional side effects of digital initiatives to increase the success of implementation of digital platforms in healthcare, which is composed of actors with often-conflicting interests.

Our findings show how an EHR implementation created unprompted change at organizational, social and psychological level. The EHR change the organization of the service, changing some habits of patients and physicians. This is empowering some roles, as secretaries, but creating new conflict between doctors at different levels of the healthcare systems. This case, therefore, highlights how the use of an EHR can change the relations and power in the chain of the service delivery. In a short time, frame trust and reputation can slowly switch from one level to another. These findings contribute to our knowledge on how to capture the technology added value from unintended outcomes and improve further the digital health ecosystem from different perspectives. Moreover, designers of digital health ecosystems will acquire insights on what are the unintended changes of the EHR implementation and how those changes affect the actors involved in the ecosystem to better calibrate the digital affordances with end-users' needs and effective usage.

REFERENCES

Angst, C. M., Agarwal, R., Sambamurthy, V., & Kelley, K. (2010). Social contagion and information technology diffusion: the adoption of electronic medical records in US hospitals. *Management Science*, 56(8), 1219-1241.

Antiseri, D. (1996). *Trattato di metodologia delle scienze sociali*. Utet Libreria, Torino.

Asadullah, A., Faik, I., & Kankanhalli, A. (2018). Digital Platforms: A Review and Future Directions. *Twenty-Second Pacific Asia Conference on Information Systems (PACIS),* 1-14.

Atasoy, H., Chen, P. Y., & Ganju, K. (2017). The Spillover Effects of Health IT Investments on Regional Healthcare Costs. *Management Science,* 64(6), 2515-2534.

Barley, S. R. (1986). Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly,* 31(1), 78-108.

Biaggi, C., & Wa-Mbaleka, S. (2018). Grounded Theory: A Practical Overview of the Glaserian School. *JPAIR Multidisciplinary Research*, 32(1), 1-29.

Brown, K. L. (2000). 'Analyzing the Role of the Project Consultant: Cultural Change Implementation', *Project Management Journal*, September, 52–55.

Burton-Jones, A., & Volkoff, O. (2017). How can we develop contextualized theories of effective use? A demonstration in the context of community-care electronic health records. *Information Systems Research*, *28*(3), 468-489.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Sage.

Charmaz, K. (2000). Grounded theory: Objectivist and constructivist methods. *Handbook of qualitative research*, *2*, 509-535.

Chemero, A. (2003). An outline of a theory of affordances. *Ecological Psychology,* 15(2), 181-195.

Chemero, A., & Turvey, M. (2007). Hypersets, complexity, and the ecological approach to perception-action. *Biological Theory,* 2(1), 23–36.

Ceccagnoli, M., Forman, C., Huang, P., and Wu, D. J. (2012). Co-creation of Value in a Platform Ecosystem: The Case of Enterprise Software. *MIS Quarterly* 36(1), 263–290.

Clarke, A. E. (2005). Situational Analysis. Grounded Theory after the Postmodern Turn. Thousand Oaks. CA: Sage.

Clarke, A. E., & Friese, C. (2007). Situational analysis: Going beyond traditional grounded theory. *Handbook of grounded theory,* 694-743.

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2011). *The Sage handbook of qualitative research*. Sage.

de Reuver, M., Sørensen, C., & Basole, R. C. (2018). The digital platform: a research agenda. *Journal of Information Technology*, *33*(2), 124-135.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532-550.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, *50*(1), 25-32.

Fairhurst, G. T., Cooren, F., & Cahill, D. J. (2002). Discursiveness, contradiction, and unintended consequences in successive downsizings. *Management Communication Quarterly*, *15*(4), 501-540.

Fayard, A. L., & Weeks, J. (2014). Affordances for practice. *Information and Organization*, *24*(4), 236-249.

Faraj, S., Jarvenpaa, S. L., & Majchrzak, A. (2011). Knowledge collaboration in online communities. *Organization science*, *22*(5), 1224-1239.

Franco-Santos, M., & Otley, D. (2018). Reviewing and theorizing the unintended consequences of performance management systems. *International Journal of Management Reviews*, *20*(3), 696-730.

Free C, Phillips G, Galli L, Watson L, Felix L, et al. (2013) The Effectiveness of Mobile-Health Technology-Based Health Behaviour Change or Disease Management Interventions for Health Care Consumers: A Systematic Review. *PLoS Med* 10(1).

Ghazawneh, A., and Henfridsson, O. (2013). Balancing platform control and external contribution in third-party development: The boundary resources model. *Information Systems Journal* 23(2), 173–192.

Gibson, J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.

Gibson, J. J. (1986). The ecological approach to visual perception. Hillsdale, NJ: Lawrence Erlbaum

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Los Angeles: University of California Press.

Glaser, B. G. (1998). *Doing Grounded Theory: Issues and Discussions*. Mill Valley, California, Sociology Press.

Glaser, B. G. (1978). Theoretical sensitivity. *Advances in the methodology of grounded theory*. Mill Valley, California, Sociology Press.

Glaser, B. G. (1967). *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine.

Gawer, A. (2009). *Platforms, markets and innovation: An introduction*. Cheltenham, Edward Elgar Publishing, 1-18.

Hah, H., & Bharadwaj, A. (2012). A multi-level analysis of the impact of health information technology on hospital performance. *Thirty Third International Conference on Information Systems, Orlando 2012*.

Hayek, F. A. (2014). Carl Menger (1840–1921). In *The Fortunes of Liberalism* (pp. 73-119). Routledge.

Harris, L. C., & Ogbonna, E. (2002). The unintended consequences of culture interventions: A study of unexpected outcomes. *British Journal of Management*, *13*(1), 31-49.

Hutchby, I. (2001). Technologies, texts and affordances. *Sociology*, *35*(2), 441-456.

Jarzabkowski, P., Lê, J. K., & Balogun, J. (2018). The social practice of co-evolving strategy and structure to realize mandated radical change. *Academy of Management Journal*, (ja).

Jian, G. (2007). Unpacking unintended consequences in planned organizational change: A process model. *Management Communication Quarterly*, 21(1), 5-28.

Jones, M.R., & Karsten, H. (2008). Giddens's structuration theory and information systems research. *MIS Quarterly*, 32(1), 127–157.

Kohli, R., & Tan, S. S. L. (2016). Electronic Health Records: How Can IS Researchers Contribute to Transforming Healthcare? *MIS Quarterly*, *40*(3), 553-573.

Kwark, Y., Chen, J., and Raghunathan, S. (2017). Platform or Wholesale? A Strategic Tool for Online Retailers to Benefit from Third-Party Information. *MIS Quarterly* 41(3), 763–785.

Leidner, D. E., Preston, D., & Chen, D. (2010). An examination of the antecedents and consequences of organizational IT innovation in hospitals. *The Journal of Strategic Information Systems*, 19(3), 154-170.

Leonardi, P. M. (2013). When Does Technology Use Enable Network Change in Organizations? A Comparative Study of Feature Use and Shared Affordances. *MIS Quarterly* 37(3), 749-775.

Leonardi, P.M. (2011). When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. *MIS Quarterly*, 35(1), 147–168.

Leonardi, P.M. (2013a). Theoretical foundations for the study of sociomateriality. *Information and Organization*, 23(2), 59–76.

Leonardi, P.M. (2013b). When does technology use enable network change in organization? A comparative study of feature use and shared affordances. *MIS Quarterly*, 37(3), 749–775.

Leonardi, P.M., & Barley, S. (2008). Materiality and change: Challenges to building better theory about technology and organizing. *Information and Organization*, 18(3), 159–176.

Lowry, P. B., Posey, C., Bennett, R. B. J., & Roberts, T. L. (2015). Leveraging fairness and reactance theories to deter reactive computer abuse following enhanced organisational information security policies: An empirical study of the influence of counterfactual reasoning and organisational trust. *Information Systems Journal*, *25*(3), 193-273.

MacKay, R. B., & Chia, R. (2013). Choice, chance, and unintended consequences in strategic change: A process understanding of the rise and fall of NorthCo Automotive. *Academy of Management Journal*, *56*(1), 208-230.

Markus, M. L., and Loebbecke, C. (2013). Commoditized digital processes and business community platforms: new opportunities and challenges for digital business strategies. *MIS Quarterly* 37(2), 649–653.

McKinley, W., & Scherer, A. G. (2000). Some unanticipated consequences of organizational restructuring. *Academy of Management Review*, *25*(4), 735-752.

Menger, K. (1892). On the Origin of Money. *Economic Journal*, 2, 239–255. (Translation of a contribution by C. Menger to Handwörterbuch der Staatswissenschaften, vol. III, Jena: G. Fischer, 1892).

Merton, R. K. (1968). *Social theory and social structure.* New York: The Free Press.

Norman, D.A. (1988). *The psychology of everyday things*. New York, Vol. 5. Basic books.

Norman, D.A. (1993). *Things that make us smart: Defending human attributes in the age of the machine*. Basic Books.

Norman, D.A. (1999). Affordance, conventions, and design. *Interactions*, 6(3), 38–43.

Pagani, M. (2013). Digital Business Strategy and Value Creation: Framing the Dynamic Cycle of Control Points. *MIS Quarterly*, 37(2), 617-632.

Pandit, N. R. 1996. The creation of theory: A recent application of the grounded theory method. *The Qualitative Report*, 2(4), 1-14.

Parker, G., & Van Alstyne, M. (2017). Innovation, openness, and platform control. *Management Science*, *64*(7), 3015-3032.

Parker, G., Alstyne, M. Van, and Jiang, X. (2017). Platform ecosystems: How developers invert the firm. *MIS Quarterly*, 41(1), 255–266.

Pavan-Langston, D. and E. C. Dunkel (1991). *Handbook of Ocular Drug Therapy and Ocular Side Effects of Systemic Drugs*. Boston, London

Ridder, H. G., & Schrader, S. (2016). Strategy Formation in Hospitals: Management of Intended and Unintended Strategic Issues in Hospitals. In *Academy of Management Proceedings* (Vol. 2016, No. 1, p. 13741).

Rogers E. (1998) *Diffusion of Innovations*. Free Press, New York.

Sergeeva, A., Huysman, M., Soekijad, M., & van den Hooff, B. (2017). Through the eyes of others: how onlookers shape the use of technology at work. *MIS Quarterly*, *41*(4), 1153-1178

Spagnoletti, P., Resca, A., & Lee, G. (2015). A design theory for digital platforms supporting online communities: a multiple case study. *Journal of Information technology*, *30*(4), 364-380.

Suddaby, R. (2006). From the editors: What grounded theory is not. *Academy of Management Journal*, 49(4), 633-642.

Stoffregen, T. (2003). Affordances as properties of the animal-environment system. *Ecological Psychology*, 15(2), 115-134.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques*. Thousand Oaks, CA: Sage publications.

Strong, D. M., Volkoff, O., Johnson, S. A., Pelletier, L. R., Tulu, B., Bar-On, I., ... & Garber, L. (2014). A theory of organization-EHR affordance actualization. *Journal of the Association for Information Systems*, 15(2), 53-85.

Tan, B., Pan, S. L., Lu, X., and Huang, L. (2015). The Role of IS Capabilities in the Development of Multi-Sided Platforms: The Digital Ecosystem Strategy of Alibaba.com. *Journal of the Association for Information Systems*, 16(4), 248–280.

Turvey, M. (1992). Affordances and prospective control: An outline of the ontology. *Ecological Psychology*, 4(3), 173-187.

Urquhart, C. (2007). *The evolving nature of grounded theory method: The case of the information systems discipline*. The Sage handbook of grounded theory, 339-59.

Vernon, R. (1979). Unintended consequences. *Political Theory*, *7*(1), 57-73.

Volkoff, O., & Strong, D. M. (2017). *Affordance theory and how to use it in IS research*. In The Routledge Companion to Management Information Systems, Routledge, 232-245.

Williams, T. A., & Shepherd, D. A. (2016). Building resilience or providing sustenance: Different paths of emergent ventures in the aftermath of the Haiti earthquake. *Academy of Management Journal*, 59(6), 2069-2102.

Xu, X., Venkatesh, V., Tam, K. Y., and Hong, S.-J. (2010). Model of Migration and Use of Platforms: Role of Hierarchy, Current Generation, and Complementarities in Consumer Settings. *Management Science* 56(8), 1304–1323.

Ye, G., Priem, R. L., and Alshwer, A. A. (2012). Achieving Demand-Side Synergy from Strategic Diversification: How Combining Mundane Assets Can Leverage Consumer Utilities. *Organization Science*, 23(1), 207–224.

Yoo, Y., Boland Jr, R. J., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization Science*, 23(5), 1398-1408.

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science*, *18*(5), 749-762.

Zheng, K., Abraham, J., Novak, L. L., Reynolds, T. L., & Gettinger, A. (2016). A survey of the literature on unintended consequences associated with health information technology: 2014–2015. *Yearbook of Medical informatics*, (1), 13

APPENDIX

APPENDIX A

Interview protocol and semi-structured interview questions

The protocol contains all the steps, activities, information and decisions made during the data collection. In the protocol we collected all questions we addressed to the interviewees, the initial questions, the questions emerged during the interviewees. Since we addressed to four categories of care actors, there are multiple questions but we did not address all of them to each interview. The questions were semi-structured and the first author allowed the interviewees to share their opinions, experiences and impressions and collected the most important outcomes according to the respondents.

Introduction

We are conducting a study to identify the current and real adoption of digital devices in everyday practices in the healthcare industry to collect data for research purposes. We are interested in learning more about how the Electronic Healthcare Records and mobile applications, used for healthcare delivery services, are used every day by different people. I will be asking you about your personal experience in using digital devices to perform your daily activities. The interview today will be kept strictly confidential and it will be recorded to allow us to analyze properly the data.

- I will be asking you to describe your experiences where you used digital devices and your personal feedback if this increased/decreased your effectiveness or remained the same.
- I am very interested in learning about which concrete working activities you actually did and how this changed the final outcome (positive or negative results).
- Before we get into the detail of each situation I will ask you to provide me a brief overview, about 1 minute, regarding the way, the reason that encouraged you to use the digital devices and which were your first impressions about this innovation.
- Normally when we talk about these types of situations it is typical to use the word “we”. For the purposes of this interview it is important for me to know what your specific role and usage of them was. Which are the steps of technology use.
- For the purpose of this interview I need you to talk about the specifics of what you actually, said, did, thought or felt during very specific times.
- We will try to cover 4 specific practices, 2 activities with successful outcomes and 2 that were not successful.
- The interview will last approximately 40-60-90 minutes.
- Ask for permission to record the interview

Warm up (3 - 5 Mins)

1. Can you introduce yourself and what you do?

   [Start by asking for some basic information to establish rapport. Typical questions include the following:
   - *Name, current position, how long they have been with the company.*
   - *Key responsibilities, projects, or activities in the last years]*
2. Can you describe your typical day in details?

[Ask interviewee about a recent experience. Ideally, within last 12 months]

First approach with digital devices (10 minutes)

1. Can you tell me about the first time you heard about EHR and mobile applications in your organization/department or working group? How were the new digital devices introduced into your working team?
2. Can you tell me about your first impression and reaction regarding this novelty? What was the impression of your working group? Did you have already the knowledge or capabilities to work with new devices? If not, how did you acquire the new requested competences? Who was involved in this process?

Work practices (20 minutes)

[Doctors of General Medicine, Ambulatory Specialist Doctors, Booking Medical Visits (CUP) operators, Administrative Operators, First Aid Doctors, Pharmacists]

1. For which working activities do you use EHR or other mobile applications? Can you make a detailed description?
2. What do you use them for exactly? How often, when and why do you use them? Which were your expectations from the adoption of EHR and/or mobile applications?
3. Can you describe the steps to follow while using digital devices in order to perform the most important working activity for your job position? Do you use them only for work or also at home for personal needs? If yes, for which personal activities do you use them?
4. How long do you use these digital devices at work and at home? Can you tell me your personal opinion if these technologies are useful and are improving your working activity? Your expectations are satisfied? *[motivate your answers]*
5. Can you describe me a situation of successful adoption and another with unsuccessful outcomes? Who was involved? Did you expect these outcomes? Why yes or no? Can you remember what you actually did in that situations?

Technology-driven changes (25 minutes)

[Doctors of General Medicine, Ambulatory Specialist Doctors, Booking Medical Visits (CUP) operators, Administrative Operators, First Aid Doctors, Pharmacists]

1. What changes did you expect from the implementation of the new EHR and mobile applications?
2. Are there any changes brought by the new EHR that you did not anticipated? If so, what are they?
3. How do these unintended changes affect you, patients, and others involved in the healthcare industry?
4. How do these unintended changes affect quality and/or productivity of your work?
5. What would be your working activity without the adoption of these digital technologies? Would it be worse or better? Why?
6. Are you satisfied with these technologies adoption at the workplace? How would you improve the current healthcare digital tools? What are your suggestions to improve them? Can you tell me a story or a real case that stimulated these suggestions?

Use of other digital tools (10 minutes)

[Doctors of General Medicine, Ambulatory Specialist Doctors, Pharmacists, Patients]

1. Do you use other healthcare digital tools or services for your daily working activities? What do you use that for? When and why you use them?
2. Can you compare the different tools in terms of use and how they support your professional activities?
3. Do you have any stories that particularly highlight the changes coming from the adoption of technological devices? For which functions the change occurred?

Patient perspective (20 minutes)

1. What do you know about EHR and healthcare mobile applications? How do you know this information?
2. Do you use them? How, when, why and for which purposes?
3. Can you describe the steps you followed while using digital devices? How do you learn to do them?
4. Do you notice some changes in healthcare service requests and delivery since you started to adopt digital devices?
5. Can you tell me which mobile applications do you use? How did you come to know them?
6. Can you tell me a situation or a story of EHR or mobile applications adoption as a personal experience or of your friends?
7. Does the relation with your physician, pharmacist or other care specialized operators change? If yes, how and when?
8. Can you give me your feedback about utility and functionality of the digital devices? Do you have suggestions to improve further the digital devices?

~ STOP TAPE RECORDER ~

Close and Summary

- Thank interviewee
- Remind interviewee that the interview is confidential and it will be combined with the others in the study.

Post-interviews activities

The first author audio-recorded and transcribed all the interviews

During each interview, we took notes on impressions and emerging patterns

We reviewed the recordings, collected documents and notes to analyze the data and interpret it

APPENDIX B

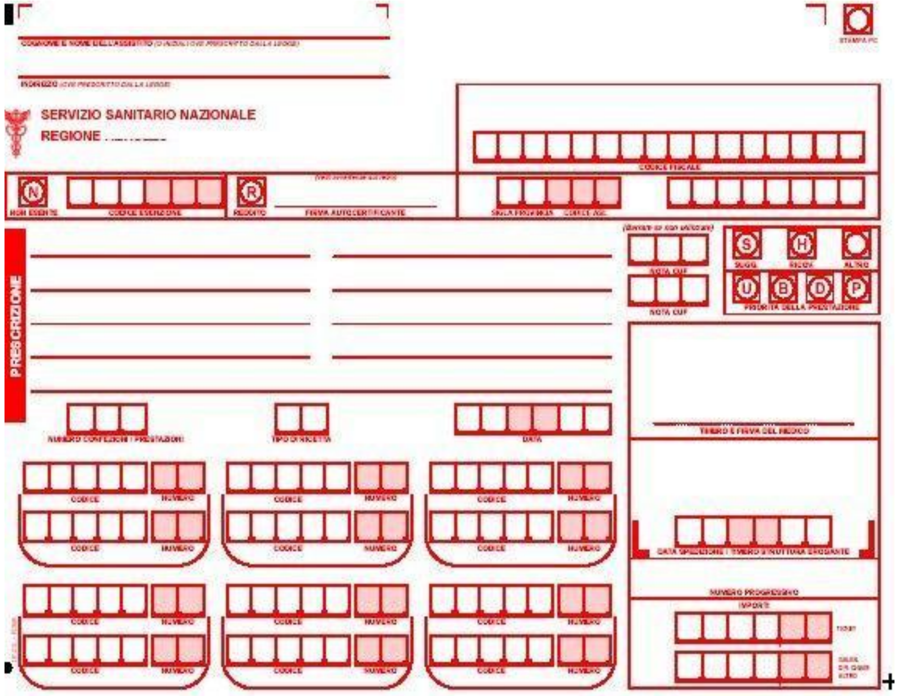
Table B 1 - Electronic Health Records features and its objectives

EHR features	Intermediate objectives	Macro Objectives	
Minimum core	Provide physicians and clinicians with a comprehensive and unified view of the health status of individual citizens	To connect the different patient care settings	**Improve the quality of care services and reduce costs**
Consult patients’ administrative data			
References			
First aid report	Ensure that citizens have timely digital access to their data		
Letters of discharge			
Synthetic health profile			
Pharmaceutical Dossier			
Consent and denial of organ and tissue donation			
EHR data and supplementary documents	Avoid delays and information asymmetries to provide appropriate and efficient health and social services	To provide a useful source of information for the planning, monitoring and evaluation of the healthcare system	
Prescriptions			
Reservations			
Clinical records			
Health balance sheets			
Domestic care: card, program and medical-assistance files			
Diagnostic-therapeutic plans			
Residential and semi-residential care: multidimensional evaluation card			
Medicine Delivery	Aggregate, share and combine clinical information and documents relating to the citizen		
Vaccinations			
Specialized assistance services			
Emergency services			
Erogation of hospitalization services			
Medical certificates			
Personal Assistant Notepad			

Reports on the services provided by the continuity of care service			
Self-certifications	To collect health results and summary documents following a patient-centric hierarchical structure, information available in different ways depending on the type of investigation;		
Participation in clinical trials			
Exemptions			
Prosthetic support services			
Data to support remote monitoring activities			
Data to support the integrated management of diagnostic and therapeutic pathways			
Other documents relevant to the pursuit of EHR objectives			
Security and Privacy	To manage and support operational processes	To provide patients with access to their data and information	
Data subject to increased anonymity protection			
Disclosure to the beneficiaries			
Patients’ consent			
Rights of the patient			
Access to the EHR by the patient			
Treatments for care, research and government purposes			
Technical regulations and security measures			

Source: Authors’ elaboration

Figure B1 - Medical prescription (paper format) red



SERVIZIO SANITARIO NAZIONALE

REGIONE ....

PRESCRIZIONE

Source: *http://www.fog.it/fogliani/giancarlo/newricetta.htm*

Figure B2 - Digital medical prescription (memorandum) white

SERVIZIO SANITARIO NAZIONALE **RICETTA ELETTRONICA - PROMEMORIA PER L'ASSISTITO**

Regione	*0000A*	*0000000001*

COGNOME E NOME / INIZIALI DELL'ASSISTITO:

PROVAX00X00X000Y

INDIRIZZO:

CAP: CITTA': PROV:

ESENZIONE: SIGLA PROVINCIA: CODICE ASL: DISPOSIZIONI REGIONALI:

TIPOLOGIA PRESCRIZIONE (S,H): ALTRO: PRIORITA' PRESCRIZIONE (U,B,D,P):

PRESCRIZIONE	QTA	NOTA

QUESITO DIAGNOSTICO:

N.CONFEZIONI/PRESTAZIONI: TIPO RICETTA: DATA:

CODICE AUTENTICAZIONE:

COGNOME E NOME DEL MEDICO:

PROVAX00X00X000Z

Rilasciato ai sensi dell'art.11, comma 16 del Dl 31 mag 2010, n.78 e dell'art.1, comma 4 del DM 2 nov 2011v

Source: *[Northeastern Region's Website]()*

Table C 1 - Illustrative quotes for intended consequences by care categories

General physicians	2nd order theme	1st order data
	Updated medical information	"I can check the history of my patients any time and monitor it. For example, often happens that patients make specialized visits and then they do not bring the results of the visit to me. Then after several months they come to me and ask another prescription for the same reason because they forgot about it. So I can check when a visit has been made and then monitor the results, ask the patients to bring the results of the visit or download it from the care organization platform." (Physician 3) "These instruments allowed me to improve the organization in my clinic and definitely have allowed me to automate situations which before required different type of work...". (Physician 7)
	Improved and tracked decision making	"Very simple case, I was at the Garda lake for the congress and a patient called me who studies in Milan and said - I have sore throat. I was free I went on a digital device I created and sent the prescription, and she went to the pharmacy with the health card and took the drug". (Physician 1) "However, the advantage that a patient can go to any pharmacy in to recover the drug if he is in Cortina because on vacation and is without a drug. And by calling a secretary you can get your medicine while travelling". (Physician 6)
	Time saving	"Our secretary's job is much more dynamic then before. S/he has more tasks and responsibility to do and this also increase her role here. For example, our secretaries prepare the medical prescriptions with the platform and when I have few minutes I check

		them and confirm or cancel. This is not only useful for us as care providers but also for the patients, they do not wait until I will finish the medical visits to give them the prescription." (Physician 3)
	Ease of finding a substitute for a general physician	"We (general physicians working in shared outpatients' ambulatories) can substitute each other at any time for planned but also unplanned events. Before when I went on holidays I had always to ask to external physicians to substitute me for that time and sometimes they were not available so I spent more time to find other physicians or I had to postpone the holidays. This is still fine but in emergency cases when I am not in the ambulatory and one of my patients had an emergency my colleagues can substitute me because of the shared platform." (Physician 7)
	Ease of use	"They [the developers of the digital platform] always say that the platform is very easy and intuitive to use. And I agree with it, it is intuitive but only when you know how to use it and understand its mechanism. Sincerely, I learned by myself how to use it in everyday tasks. For example, some aspects of the EHR and feature I discovered them only several months later while discussing with other colleagues or while solving technical issues." (Physician 4)

Pharmacists	**2nd order theme**	**1st order data**

	Differentiation on service quality	"Now the distribution of the patients across the pharmacies is more equal and it is based on the preferences of the patients and on the quality of the service delivered. Before, the pharmacies close to outpatient ambulatories were privileged, they served most of the patients. So they could deliver the services as they preferred because they were sure they would have patients continuously because of their strategic position. But so many times patients came to me and I am out of this privileged pharmacists and told me I would prefer to come to you are nicer than the other pharmacist. " (Pharmacist 4) "Now we will focus mainly on the preferences of the patients and how to make feel them better. In this way patients will come back to us and we will differentiate our self as recognized professionals, as quality service providers." (Pharmacy 2)
	Professional recognition	"... explaining to colleagues the final goal, the territorial participation of the pharmacist in this project, the importance of integrating into the regional health system as an extremely active part and as an operational terminal in the territory... because the pharmacy is the most widespread element of the territory gave confidence, we were supported by our colleagues in this process". (Pharmacist 1) "I don't want to brag but I was one of those who coined this term "zero km" pharmacy, so we are recognized both by citizens but also by public institutions as a determining element on the territory also valuing our profession. This was one of the first steps to determine the value and even enhance the role of pharmacy in the territory and the health system of the region". (Pharmacist 1)

	Business innovation	"There is a possibility for pharmacies that do not have the doctors around to have their user base in small towns or districts... that no longer have doctors or districts that no longer have doctors because they were aggregated... This certainly affects the patient's path of the prescription from the doctor's clinic to maybe the pharmacist below...So we have the pharmacies and that are luckier and others that are less fortunate”.(Pharmacist 1) "Now we are asked to update all our technological infrastructures, which is positive for the entire process and aim of the digitalization. In fact, this involves other changes and raises requirements. I bought new computers, enhanced my Internet connection, integrated new operation systems for being part of the information systems of the public care service. This inevitably brings to an innovation also in our business, internal organization and the quality of the services we offer. But at the same time, these requirements are very expensive and we have to cover them without any public help. (Pharmacist 4)
	Spending more time with patients	"At the beginning it was a bit hard to insert the new tools in our routines. But after the initial phase, we appreciated the easiness of the platform. The majority of the time it provides me with the correct information required by patients for a specific medicine. We do not need to spend time to enter the data in our databases, check the availability of the medicine, the different brands ect because this time is precious and now we can spend it

		with the patient for a small chat. However, this is possible when the system works, but when it does not work everybody is nervous." (Pharmacist 3)

Patients	**2nd order theme**	**1st order data**
	Quality based choice	"...before I had to go always to the same pharmacist, every time I felt mistreated, plus I had to go on specific time. Now with the digital pharmaceutical prescriptions, I can go to the pharmacist close to my job when I finish and I feel I am real client treated properly." (Patient 4)
	Expanded memory	"In the past I tended to forget the paper prescription and when I went to the pharmacy, i could not fill in the medicine. You know I have a certain age. Or sometimes I took just one prescription when I had to take other two with me because I have more than one chronic disease. So I had to go home to take them but maybe in another day when I was less busy. Instead now, I have always this information with me with the phone or with the medical card." (Patient 2)
	Time flexibility	“You know, I am a grandma’ and I have four grandchildren to take care of. But you, I am also old and have some chronic diseases unfortunately so I have to take the medicines every day. It is so difficult sometimes to come to visit the doctor and have the medical prescription because my children work the entire day and they cannot stay with their babies in the afternoon, so I help them. But who helps me with the medical prescription? Now

		there is the white paper, I don’t need to visit my physician so often. At the end that medicines are always the same.” (Patient 6)
	Feeling empowered	"I am more active now, at the beginning it was a bit difficult because to learn and follow all that steps but then I felt the difference. I can make decisions with my general physician, I follow the steps with more involvement. If I missed some time to the take the medicine, I blame myself and better understand how important this is." (Patient 6)

Technology-driven organizational change planners and implementers	**2nd order theme**	**1st order data**
	Connected multiple care settings	"Now you know the general physician can have access to the results of the specialized visit if the patient gave the consent. It is possible thanks to the platform, without wasting time, fixing visits for administrative purposes." (IS director)
	Rich and updated information for planning and remote monitoring	"Having access to your previous visits, results and future activities make an important step forward. Patients can plan their activities, have always access to their data and from the other side, physicians can remote monitor their progress or needs. In case of insistent requests from patients, physicians can explain with real medical information how to change the path and better support the patient also emotionally." (Director) Care organizations will have the opportunity to check the frequent visits and control the reason with he aim to reduce the duplication tests. Some medical tests and visits are mandatory but some of them may be just a duplication because of lack of previous results.

		But now this is possible to avoid. From the other side there will be also more available places for medical visits for other patients, who might be in need." (IS director)
	Continuous access to medical data	"Now patients can have access to their data everywhere. For example, if a patient is on holiday s/he can fill in the medicine from the pharmacy, which is close to their hotel or if the medicine they take breaks can however buy another medicine directly from where they spend their holiday. This is particularly evident for patients with chronic diseases". (Director)
	Improved quality of care	"In any occasion, patients have the data with them for urgency cases, holidays. This helps a lot also emotionally they know they can have access to their data any time." (Project Manager) "Now patients have more time and more flexibility to organize the tasks they are required to do for their treatment. They can go to the pharmacy at any convenient time, they can make more informed choices, (...) they are more empowered and responsible for their care path (...) general physicians now have more tools to better organize their office ours for bureaucratic and medical reasons. I think this initiative is better off for everybody involved." (IS director)

Source: Authors' elaboration

Table C 2 - Illustrative quotes for unintended consequences by care categories

General physicians	2nd order theme	1st order data
	Increased workload	"This platform has been introduced in our work to facilitate our lifes, right? Many positive aspects have been highlighted during the presentation but noone informed us about the increased workload. It was too much, you know we have to collect the informed consents, we have to expalin patients how to use it, how it works, we have to solve technical problems. I didn't expect it. The positive effects come much later then the increased requests we received. And almost nothing in exchange." (Physician 5) "I have to do so many things before I can experience these benefits from digital data. I mean, I have to work more such that others (physicians) can benefit from my work but I still did not see benefits from other physicians." (Physician 9)
	Abuse of empowered patients' role	"I agree to improve the role of the patient and make him/her more active and aware of the entire process. This is right and is part of his/her life, but now they are exceeding with pretentions and continuos controls on my work as physician after 30 years I treated them. For example, it was December 24, it was my turn in ambulatory and I receive a phone call on my personal phone becuase I gave it only for emergency cases to give more support and I receive a call where the patient informed me that I have to prescribe him/her the medicine in time otherwise he/she will be out of scheduled deadlines. His/her medicine

		for chronic disease was fine and only in 2 weeks s/he would need the new prescription. I informed him/her about this and s/he said with holidays break you never know." (Physician 11)
	Information Privacy concerns	“So if before the prescription [forms] were given to me by the state now instead I pay for it... I underline that at the beginning there was still support from the region regarding the expenses. Now however the expenses again I have to sustain by myself ... it is a marginal aspect but nevertheless I have to work for something that then I have to pay” (Physician 4) “A patient called our secretary angrily asking to tell the doctor that [the app] is not working, as it were my fault” Physician 4) “It must be the ASL that anyway takes charge of the situation and solves the problem is not us... the ASL in the figure of the general manager will appoint an employee who will have that role and who will be in change to accept these things here” (Physician 6) “This [consent and training] is a problem for the administration and not for the doctors, so I am a doctor, I am not an administration, and so I do not agree that I should be doing this when I know that in many other regions everything has been done by the administration of the ULSS. I personally have no intention of doing this until I am legally obliged”. (Physician 11)

	Increased costs for digital devices	"....you know, I had to pay everything by myself even if I did not support this initiative sincerly. It seems not very organized. At the benning we were offered some incentives, but then everything was on my on my budget. If tomorrow they (the region) will implement another one, should I cover again other costs with my budget?" (Physician 8)
	Over and above digital platforms and apps	"...we have so many passwords and accounts to login to see this data that we become crazy. I agree with the benefits, but they are so disconnected, why can't we access that data just with one account. Also each account requires different passwords and you know the lenght of secure passwords. The we have to update them and in different times and this creates such a confusion. Sometimes I don't even search for some information becuase I don't to to the entire process to get it, it is too long." (Physician 7)

Pharmacists	**2nd order theme**	**1st order data**
	Increased costs for digital devices	"I support the innovation in our profession, the use of digital tools to facilitate our job and immprove the performance but on the other side, this is very expensive. I mean, I bought two extra computers, improved the Internet connection, higher costs for the new softwares and all of this only at our expensive. If in 2 years new platforms will be implemented we will have to face similar economic expensive." (Pharmacist 6)
	Technical malfunction of the platform	“…there have been cases of doctors who do not send - but for different reasons - the prescriptions. In that case [the patients] were coming to the pharmacies with a code and asked to download from us - something that among other things we cannot do because it is violation of privacy”. (Pharmacist 3)

	Lack of data access at patients' pharmaceutical dossier	"The software of different pharmacies cannot communicate with each other due to privacy issues. In fact, the Electronic Health Record is the electronic file with the patient's health data, which the patient carries with herself and which she can retrieve with her health card. I cannot communicate patient data to other pharmacies we have constraints and we have to be very careful about them and it is also right that this is the case". (Pharmacist 1)
	Increased patients' self-management	"During the last phase [of implementation] when the medics started to send the prescriptions in this [digital] way ... patients obviously avoided going to an outpatient clinic and waiting for the prescription … and so left more room for the medic to carry out his activities in peace and with more precision… to prepare prescriptions that are regularly prepared in a standardized way for continuous care" (Pharmacist 3)

Patients	**2nd order theme**	**1st order data**
	Digital literacy requirements	"...I am not young you know, I have my age and all this technology is good but I don't know how to use it. Especially at the beginning. So I asked to my grandaughter and she helped me. But then after some time I forget it so I ask her again. I like it so I can also spend some time with her. But a friend of mine is alone, so she doesn't know how to do so I help her only for what I remeber eh. (Patient 5)
	Multiple login accounts	"There are so many passwords to remember. It is too much if I remember my birthday. I write the passwords on a paper but if I am out and I need to download something I cannot

		do it becuase of this. This is bothering. There are too many accesses to do before receiving that information." (Patient 3)
	Family and/or legal guardian dependence	"When my physician explained me how to use it, it was fine it seemed so easy. Then I came back home and I tried but it did not work. I did not remember at all. So I asked to my daughter, she is young you know so she helped me but if I didn't have her what could I do? I should have gone back to my physician or to the secretary. I felt very dependent and this is a problem for me because I always tried to be as independent as possible but this is difficult." (Patient 2)
	Complex (long) digital profile generation	"I had to do some steps before having my app and my profile. My physician helped me a lot because after a while I did not want to. But he was nice and patient so after the password on my phone finally I got it. Maybe something more easy could be thought." (Patient 6)

Technology-driven organizational change planners and implementers	**2nd order theme**	**1st order data**
	Excessive care actors' resistance	"For the fact that this digital initiative has been created, developed in collaboration with direct end-users, I would never expect such a resistance from some care actors especially. Several strickes, confirmations and continuous disconfirmations, after so much work." (IS director)
	Information Privacy concerns	"The issue with information privacy is pretty long and complex. We took this into consideration even before and several activities have been done from the beginning. But we would not expect that initially some care actors would support the collection of

		informed consents, which also highlights their role in this initiative. The same actors later changed their mind and did not collect them anymore." (Director)
	Long implementation time	"The introduction of digital technologies in care organizations have always took some time, but after a while it started to bring its results. In this case, several challenges have arosen since the project started. Although the goals, the aims and the obtained results are positive, the implementation time is long and much work has to be done. We started now to collect the consents also in care organizations to free general physicians of this duty and foster further its use." (Project Manager)
	Generation digital divide	"Many initiatives have been created to facilitate the introduction of these platforms in care routines, but more work has to be done for those categories of patients who are alone without a family support. More social support has to be offered also for patients who are guided only by legal guardian." (Director)

Source: Authors' elaboration

Tables for Summarizing the Results

Table 1: Intended consequences by stakeholders

Type of stakeholders	Objective 1	Objective 2	Objective 3	Objective 4
Patients	Quality based choice	Feeling empowered	Expanded memory	Time flexibility
Doctors	Ease of finding a substitute for a general physician	Updated medical information Ease of use	Improved and tracked decision making	Time saving
Pharmacists	Spending more time with patients	Business innovation	Differentiation on service quality	Professional recognition
Others (PM, MAA. IS Director)	Connected multiple care settings	Continuous access to medical data	Rich and updated information for planning and remote monitoring	Improved quality of care

Source: Authors' elaboration

(Note)

Objective 1: To connect different patient care settings

A) by providing physicians and clinicians with a comprehensive and unified view of the health status of individual citizens

B) by ensuring that citizens have timely digital access to their data

Objective 2: To provide the patient with access to personal data and information

Objective 3: To provide a useful source of information for the planning, monitoring and evaluation of the regional health system

A) by avoiding delays and information asymmetries to provide appropriate and efficient health and social services

B) by aggregating, share and combine clinical information and documents related to the citizen

C) by collecting health results and summary documents following a patient-centric hierarchical structure, information available in different ways depending on the type of investigation;

Objective 3: To manage and support operational processes

Objective 4: To improve the quality of care processes also through research

Table 2: Unintended consequences by stakeholders

Type of stakeholders	Negative Spillover	Positive Spillover	Backfire	False Progress
Patients	Complex (long) digital profile generation		Multiple login accounts	Digital literacy requirements Family and/or legal guardian dependence
Doctors	Increased workload Abuse of empowered patients' role Increased costs for digital devices		Information Privacy concerns	Over and above digital platforms and apps
Pharmacists	Increased costs for digital devices	Increased patients' self-management	Technical malfunction of the platform	Lack of data access at patients' pharmaceutical dossier
Others (PM, MAA. IS Director)	Excessive care actors' resistance		Information Privacy concerns Generation digital divide	Long implementation time

Source: Authors' elaboration

Making a Healthcare Platform Work: A Case of an Italian Health Information Exchange Platform

Cristina Trocin[1]

Abstract

Digital platforms are created on top of digital infrastructures, which provide the computing and network resources to orchestrate the service and content needs of multiple stakeholders. While connecting multiple actors, they remove any dependence on location and stimulates distribution of expertise across geographical and organizational boundaries. Although their pervasive proliferation is justified by their ability to collect, to store, and to make digital data available across a number of systems and devices, healthcare organizations faced several challenges to make them work effectively. The mobile connectivity affords the separation between clinical needs and the management of administrative processes performed by secretary. This improves physician-patient relationship and affords pharmacists to spend less time in understanding the content of the medical prescription thus having more time for treating the patient. An Italian health information exchange platform presents the benefits and lessons learned during the process of platformization and infra-structuring. I argue that the alignment of often-conflicting care actors' interests is crucial for sustainable efforts to increase connectivity among care actors.

Keywords: *Health Information Exchange, multi-sided platform, case study, connectivity*

Presented at 10th International Research Meeting in Business and Management (IRMBM 2019). July 8th 2019, Nice, France

---

[1] Single author, Department of Management, Ca' Foscari University of Venice, Italy

INTRODUCTION

Digital technologies have the potential to connect actors engaged in intra and inter-organizational interactions. The connectivity enables execution of inter-organizational processes and synchronization of cross-departmental activities with-out physical and temporal constraints. For instance, in healthcare industry, the department of General Medicine is potentially connected to the department of Cardiology through shared patient's information collected during previous medical visits. Additionally, digital technology connects the past with present information collecting the medical history of each patient, which has the potential to provide better diagnosis thanks to detailed past medical data.

The digital platforms implementation increased the connectivity and modified organizational knowledge management by changing the storage, retrieval, coordination and reuse process and the role of the tacit knowledge of the physicians. Although the introduction of multisided platforms in healthcare industry brought organizational change, however it still did not achieve its full potential because we can never fully know all the forms and extensiveness of all our social and technical connections. Therefore, it is necessary to conduct case studies to investigate the benefits of an increased connectivity in care settings.

This article addresses the questions: How the main benefits of Health Information Exchanges implementation in care organizations impact the connectivity of care actors?

The structuration of an ecosystem offering digital healthcare services did its mainstay on collaboration and participation of healthcare professionals leveraging on their expertise, on the co-creation of ideas and on the co-design service involving directly the end-users. The methods adopted are co-design workshops, focus group and brainstorming. The contribution of the patients represents the keystone to create useful and usable services for healthcare everyday activities and at the same time ends up with enriching the construction of the healthcare digital ecosystem. The innovation lays in the integration of different needs of all involved categories in an open space for dialogue, listening, co-creating and negotiating towards proposals for common innovative solutions. Mobile applications offer tailored services for digital health that directly and predominantly involves the patient (patient-centered-healthcare-ecosystem).

Patient-centered care system can be seen as a partnership among care givers and care receivers to diagnose and prescribe a suitable treatment. Zhou et al (2016) suggested six aspects to define this concept referring to shared decision-making, psychosocial support, access to information, access to care, coordination of care, and self-management. Three pillars guide the management of patient-centered care organizations. (1) Efficiency aims at reducing healthcare costs by avoiding unnecessary diagnostic interventions, increasing communication between healthcare institutions and the patient. At the same time, it is committed to ensuring the quality of health services through comparisons between different suppliers thus enhancing the delivered quality (2). Encourage the empowerment of patients (3) by making personal data, medical records, diagnosis and treatment accessible through digital platforms and by making more responsible and aware of the care information process.

Increasing the quality of the doctor-patient relationship to facilitate shared decision-making is a direct consequence of patient empowerment (Gabutti et al, 2017). The digitalization of information systems increases the probability to maintain and further improve these three pillars. The healthcare quality is not only a medical concern but it is also about the process to reach outstanding care results. What seems to be missing is the digital health is the role of health technologies for physicians, pharmacists, patients and how they are adopted to satisfy specific needs either medical or organizational and managerial needs.

Mobile health as part of digital pervasiveness and evolution is an emerging paradigm that improves the decision making, the management of chronic diseases, of personal medical data and of monitoring the treatment process. The common factor among these variables is empowering the active users of mobile applications. This is challenging the nature of organizations as the mobile virtual workplaces free workers from ties to particular places and times, instead they are decoupled from one another. Thus patient empowerment requires increased interaction between caregivers and data integration to deliver a quality and sustainable service however it lacks the effects of individual and organizational factors in the adoption process. This empirical paper aims to understand what is the role of health technologies, and how are they adopted and implemented in organizations to support and contribute to organizational adaptation to sudden changes such as the emerging of a new care paradigm, patient-centered model.

Another perspective of the mobile health is the necessity to manage a large amount of clinical data coming from different structures such as clinical centers and pharmacies, which creates difficulties in finding the necessary information at the time requested. The use of technological innovations in the healthcare sector can solve several critical issues. In fact, ICT offers flexible and scalable solutions for the services required by the community and to improve the quality of services offered. The process of digitizing the healthcare eco-system allows to exploit different advantages such as distributing limited resources according to a logic that puts the patient at the center, monitoring the company's performance, facilitating the interactions between the many actors involved, optimizing internal processes to offer a more efficient service of higher quality. The perspective of digital affordance allows us to investigate the adoption of mobile health application by physicians, pharmacists and patients (Zammuto et al, 2017).

The objective of introducing electronic medical prescription of medicines and prescriptions is linked to objectives of potential improvement in terms of efficiency in the National Health Service - saving financial resources, speeding up the procedure, but also better monitoring of expenditure and appropriateness in real time - as well as potential improvements in the effectiveness of the NHS and better impact on citizens, for example through a reduction in bureaucracy and a relative simplification of the care and prevention path. In order to implement measures of appropriateness of prescriptions, allocation and verification of District Budget, pharmacovigilance and epidemiological surveillance. It is therefore also an administrative act that allows the citizen: to purchase medicines at total or partial load of the NHS, within the limits provided by the levels of assistance and classification of the drugs themselves; to require specialist or diagnostic services in both public and private facilities, the latter only if accredited.

In this context, the way in which change is communicated and consequently managed plays a crucial and decisive role. Reorganizational projects can produce a real "systemic" change by involving not only a small group of professionals but all actors involved directly or indirectly in the digital ecosystem. Excluding some players regardless if core or periphery may compromise the evolution of the entire innovation design platform. For these reasons, the mobile application will be also an information mediation tool for those who design innovation, those who are called upon to put it into practice and those who use it really effective. Its core concept expands from technological and organizational field to embrace also a communicative approach. Thus it will be a showcase oriented towards sharing and storytelling of the projects that aim to shorten the distances between innovators in health care, operators and citizens.

The paper is organized as follows. First, I present the new trends of platformization and infrastructuring in the healthcare industry in a northeastern Italian region. I then introduce the clinical and organizational needs that stimulated the rush towards the digitalization in Italy as part of European initiatives. Next, I present the case study of consortium, which is working for connecting multiple actors with often-conflicting interests though a digital multisided platform in the northeastern Italian region. Later, I discuss the benefits of an organizational transformation of the regional health ecosystem. To conclude, I discuss the lessons learned and suggest the policy implications of Health Information Exchange usage.

THEORETICAL BACKGROUND

Platformization and connectivity

The long-held belief about the mirroring between the structure of a service development organization and the architecture of the service created is put into question. The connectivity among its users is achieved in different ways due to technical and social characteristics (de Reuver et al, 2007). In the specific case of Health Information Exchange platform, the organization of its development project is more flexible and follows a problem-solving approach. This means that the working teams are created based on a specific need to complete the project. During its development phase, if it faces new challenges from a technical view then a group of experts will work until the issue will be solved (Derry et al, 2004). Once the task is accomplished the team is released and the members are redirected to other tasks. Anytime a new need or issue arises, a new group of experts is created until its accomplishment. Thus, an organization willing to create a service is composed of problem-solving teams without having to mirror the architecture of the service created. In our case the service created refers to providing structured information through a digital platform without reflecting the structure of the service development organization.

Observing the last five years of platform creation, I noticed that technical systems of the platform continue to reflect (mirror) the service development organization but integrated systems increased their scope and scale. The integration process followed another path as it developed new capabilities and acquired a new infrastructure because it had to connect the entire network of technical components of the platform which required multidisciplinary expertise. So, the technical architectures and the organizational structures are dynamically changing over time supporting new value-creating interactions (Constantinides et al, 2018). To be able to gain the added value, the owners of the platform need to align the users' behavior with platforms' objectives and this will create a tailor-made control mechanism.

Platformization is a new trend experienced in recent times that provide more digital functions and transcend existing organizational structures (Kaschig et al, 2016). An example is the creation of mobile applications to enlarge the service offered but also to facilitate the access to specific services for niche users of the wider platform and this creates new value-creation opportunities. This provides evidence that infrastructures are undergoing a process of platformization thanks to increased digitality that opens the composition of an architecture and the governance control points.

A complementary trend occurring refers to the process of infrastructuring of the digital platforms by expanding their reach and rendering them much more physical (Küpers et al, 2016). Multi-sided platforms are an example of this new trend as they enable multiple users to communicate on a digital platform and increase the value for one another (Waizenegger et al, 2014). For in-stance, dematerialized medical prescriptions created the opportunity to connect instantly the patient with the pharmacist on the same day and to withdraw necessary medicines. Multisided platforms became popular because their actors acquire more control over the process they are undergoing, the distribution is facilitated as it is less complex with less transactions among involved actors (Al-Dabbagh, 2015). At the same time, they increase the value for one another through sharing information.

Platformization and infrastructuring are two innovative forces that increase the connectivity among core and peripheral actors but at the same time they change the organization of the ecosystem itself because of the disruptive effect of redistributing control across online users and the mobile applications they use. Analyzing these two innovative trends concomitantly allows us to understand the layered mechanisms of multisided platforms that foster organizational change and the digital co-evolution of its participants.

METHODS

Research setting

A northeastern Italian region with a population of 4.9 million embarked in the digitalization process of healthcare industry, which is influenced by internal and external factors and by international, national and regional standards and laws. The main driving force of change is the socio-demographic evolution of the population referring to the trend of aging population and the epidemiological transition from infectious diseases to chronic and multi-chronic diseases. Changes in the demand of the health services can trigger a trans-formation in the care industry composed of organizations, public institutions, care consortiums, and accredited hospitals. Northeastern Italian region has been experiencing a change in demand, which moves from infectious diseases towards chronic ones. To cope with this change, a new way of providing healthcare services deemed necessary.

This region tries to find a balance between the limited financial and economic resources and the quality of the health services provided. The effort led to a search for new ways of health services delivery. During this process, emerged a compelling need for integration of all actors of the entire health ecosystem, including healthcare organizations, doctors, patients, third part suppliers, pharmacies, and research centers. The necessity of an integrated health ecosystem was strongly supported by care providers, patients and indirect actors during the process of co-defining new forms of service delivery.

> *"The first really obvious problem that health care is facing in the digitalization path is the use of incompatible systems. Because it is not possible for us [care actors] to have a digitalization of all the processes with a mosaic approach where we have different digital systems for different things, we have to do at least 12 logins and we have to learn to familiarize with completely different software that even do not talk to each other. For instance, if I have to do medical prescriptions I use a certain program, if I have to add new infor-mation to Electronic Healthcare Record I use another program and if I have to register a prescription I have to use yet another pro-gram. There is such a great fragmentation from an operative system point of view and therefore also of the practices that lead towards the demotivation." [*Physician interview]

The integrated ecosystem would be composed of disparate networks that enable communicating to each other, providing medical and financial data in real time, monitoring patient's health, allowing a systematic evaluation of clinical risk and di-agnostic and therapeutic procedures, and assessing the satisfaction of the patient.

The collective endeavor towards digitalization was accompanied by regional a Research Centre for eHealth Innovation in the northeastern region. It assumes a transversal role for the region's care system and governs the ICT systems supporting the care organizations towards the digitalization of people, processes and the entire ecosystem. The Consortium offers a common ground for the experimentation and the testing phase before the implementation of new platforms, devices, innovative organizational models in care organizations.

In 2007, the consortium was created for spreading the concept of eHealth in the region. One of the first issues tackled was the lack of interoperability of standards among different digital solutions across regional care organizations to solve the mosaic problem: multiple, independent and incompatible digital tools in different departments. Several standalone solutions had been created for eHealth programs in northeastern Italian region, which were not able to communicate among each other.

Today, the consortium is engaged every day with managing the creation of digital infrastructures and the implementation of organizational and technological platforms in the northeastern region's healthcare ecosystem. Its mission is to improve the health processes towards an inter-company collaboration with a three-fold aim: optimizing resources, containing costs and facilitating the management of change.

The necessity of integration

Information and Communication Technologies (ICT) have infinite affordances (material and digital at the same time) to materialize an integrated health ecosystem. Indeed, digital technologies can spread and release information among actors, in-crease the coordination and monitor the information flow. ICT has been enabling transformations in the healthcare domain. Some stakeholders are afraid of being substituted by digital technology or afraid of not being able to use the technology competently, while others are excited about the new possibility that digital technology can bring.

As evidenced by the Digital Agenda 2020 signed by European countries, digital health is a high priority in Europe. According to World Health Organization (WHO), digital health will make an important difference in controlling long-term costs, producing better health outcomes, empowering patients and care providers, while introducing new contributors to the health ecosystem.

To appreciate the context in which northeastern region's implementation of a new HIE platform, it is helpful to understand broader initiatives by European Union. European Union is engaged with policies and initiatives that aim to provide top quality digital services in health domain. These polices and initiatives intend to empower citizens to build a healthier society and to offer citizen-centered health services.

European Union focuses on three priorities. The first one is to provide citizen secure access to personal health data across EU borders, the second refers to the implementation of personalized medicine through shared European data infrastructure while the third one focuses on increasing citizen empowerment to encourage people to take care of their health and to stimulate interactions between patients and care providers.

The context of mobile care applications

While creating the digital infrastructure, consortium made some strategic decisions to boost the usage of the Health Information Exchange platform through the dematerialized medical prescription and the mobile app. The mobile app is aimed to increase the connectivity between patients and pharmacists after having received the medical prescription. Indeed, when the patient needs a medicine for a chronic disease, she does not need to go physically to personal physician of General Medicine. Instead, the entire process has become digitalized with the following information flow:

1. the patient requests the prescription of the medicine to the physician via phone call, email, or Whatsapp;

2. the physician creates the digital medical prescription and send the confirmation to the patient;
3. the pharmacist receives the digital prescription via personal health card or mobile application and s/he delivers the prescribed medicine to the patient.

The app better connects three categories of care actors and the collected data is digitally stored in the digital infrastructure that creates the patients' medical history useful for future diagnosis. The trends of infrastructuring and platformization are pronounced concomitantly in the mHealth solution as it opens the digital architecture and the governance control points while integrating different sources of information. The mobile solution addresses multiple needs such as accessing dematerialized medical prescriptions, monitoring the process of continuous personal healthcare, increasing awareness of the healthcare process, understanding how the healthcare system works, and empowering patients to take more responsibility for personal medical data management.

Data collection

I used an inductive qualitative research methodology (Corbin and Strauss, 1998) to identify unexpected consequences in the context of implementation of an Italian Electronic Healthcare Record (EHR) system. I believe that grounded theory approach provides a suitable framework to investigate the main benefits in relation to the digital health ecosystem implementation (Barley, 1986; Leonardi, 2013). More precisely, I investigate the benefits of constant connectivity in a healthcare ecosystem fostered by the adoption of EHR and health mobile applications.

This study is part of a broader project about digital platforms implementation in care organizations in a northeastern Italian region. I collected 38 interviews from multiple care categories. For this specific study, I used 23 interviews with a total number of 19 hours from patients, pharmacists and physicians (see Table 1). In the selected interviews, the theme of connectivity emerged continuously therefore I embraced this topic for further investigation.

Role of Interviewee	Interviews Completed	Hours	Period
Physician	12	12	Nov-Dec 2017
Pharmacist	4	4	Nov-Dec 2017
Patient	7	3	Nov-Dec 2017
Total	**23**	**19**	

Table 1. Data collection summary

Data analysis

During data collection, I combined insider and outsider perspectives from four perspectives in line with grounded theory approach (Strauss and Corbin, 1998) and with prior research studies in related fields (Barley, 1986; Leonardi, 2013; Sergeeva et al, 2017; Williams and Shephered, 2016). I used NVivo as the digital tool to organize and analyze the collected qualitative data. As a common practice in inductive research, I followed and iterative approach and involved continuous comparisons of emerging data.

For the data analysis we used the "input-process-outcome" (I-P-O) framework, which was used by prior studies to investigate team effectiveness (Zwikael and Smyrk, 2012; Espinosa et al, 2006; Powell et al, 2004; Powell et al, 1996). We followed the Espinosa *et al.*'s framework for coding and data analysis. During the analysis, I focused mainly on the inputs, the processes and the outcomes occurred during the implementation and post/adoption phases of digital technologies in a healthcare sector.

The inputs refer to the tools and specific elements such as digital medical prescription, digital dossier. Task processes refer to those actions and procedures which took place in relation to previously identified inputs. The results of the previously identified actions brought to specific consequences, which in this study represent the outcome. I followed this framework to uncover two typologies of consequences, namely intended and unintended. Then, I continued the analysis with the intended outcomes in order to indentify the main benefits emerged per each ategory of actors. I considered intended consequences those outcomes that are in line with the goals of the EHR implementation such as to provide the patient with access to personal data and information. Whereas, I considered unintended consequences those that occured but they we not foreseen or aimed from the technology implementers, such as generation digital divide or long time implementation.

Initially, the text of the interviews was analyzed with open codes to collect the recurrent themes and actions while using digital technologies in a healthcare setting. Per each interviewee we collected the codes in an Excel file and assigned a unique identification number for each code. For example, from the interview with the first pharmacist we collected 103 codes, 29 inputs, 18 processes and 55 consequences. The identification number per each code was assigned with a hierarchical approach as follows. Each category of care actor had a common ID, for patients we selected PT, for pharmacists we opted for PHAR, for general physicians we selected MM, for specialized physicians I opted for MAA or MAO depending on the typology of the care organization, for Information System (IS) director I used ISD, for project manager I used PM. Based on the chronological order in each category of actors, I assigned a number from 1 to 10. For example, the 5th interview I conducted with a patient is coded PT5. Per each interviewee and per each code I assigned an ID based on the typology of the code. For example, the inputs collected from the interview with the first pharmacist are numbered as PHAR1-I1 till PHAR1-I29. From the same interview, I identified 18 processes that I numbered from

PHAR1-P1 to PHAR1-P18. For the outcomes, I made a distinction between intended and unintended and assigned a number based on the chronological order during the interview (such as PHAR1-O.UN1, PHAR1-O.INT13).

Next, I proceeded with attributional coding in order to identify the relationships between the previously identified topics. Specifically, I aimed to identify a link between the intended and the main benefits of the EHR implementation and the inputs and the processes that generated them. For example, in the interview with the first pharmacist I extracted the following intended outcome PHAR1-O.INT23 "*maybe we (pharmacists) can gain a bit of time during the pricing*", which was the result of the input PHAR1-I13 "*the computerised data is already available*" and the process PHAR1-P13 "*when we are there (in front of the patient) and we prepare the prescription and all the patient clearly speaks to us, asks us for information and the attention is more focused towards the patient and less on the level of the shipment of the prescription*".

RESULTS

Increased connectivity through HIE and its digital infrastructure

The clinical needs that boosted digitalization in northeastern Italian region

The idea to create the current Health Information Exchange started from the clinical need of radiologist and cardiologist to perform their job with the technology. Private providers furnished sophisticated digital machines that improved diagnostics thanks to immediate availability of images and better management of medical data analysis. At the same time these machines collected medical and valuable information that at that time remained the property of the private suppliers, who provided these machines. Later, the collection of information became part of the systems of care companies, which are called Complex Organizational Units. They collected and stored the medical information to provide them to physicians. Thus, each unit stored the medical information in its own database without exchanging it with other actors. As a result, the exchange of clinical data was possible only when different care organizations used the same type of machine sold by the same supplier.

With an increased use of the new technologies in health industry, the legislation made new rules for the digital management of medical information, ranging from the creation of digital documentation to its storage in a new digital archive. The first steps towards the digitalization started with the creation of electronic patient record, digital dossier and others. One of the difficulties encountered during this phase was the back and forth between the emergence of new tools and the creation of a new legal rule in that field. When the new technological tools did not meet the new rules established later, the care units were obliged to adapt the already acquired tools to the new legal standards. This misalignment between technologies and rules required new investments and time, slowing down the care organizations' digitalization.

The current Health Information Exchange platform was set up many years later. In the first years, there was no clear idea or definition of the present multisided platform. Each initiative was self-managed at regional level. Indeed, the need of integration and connectivity emerged not only at organization level but also at regional one because the new national norms in respect to the HIE emerged after the creation of the first digital dossiers in some Italian regions.

Health Information Exchange platform components

In 2012 was created the first regional law to define the components of the Health Information Exchange platform and its infrastructure. The consortium won the public tender to develop this project. The 2012-2016 Regional Social Health Plan called for the need to develop organizational models of assistance and governance of activities to create synergies between the different local health and social units.

During the first three years was developed the digital infrastructure to enable the connectivity among care actors. This phase is in line with the infrastructuring trend that provides the network resources to orchestrate the actors' needs. Since 2015, the consortium with the cooperation of all care actors has been developing digital services such as dematerialized medical prescription and mobile care applications. This can be characterized by the platformization trend, which provides new solutions and transcends existing organizational structures with a problem-solving approach. The structured cloud of information is now available to exchange medical information among care actors in line with national and regional rules that regulate the digital health do-main with respect to security and privacy policies.

Privacy issue was an argument of long lasting litigations between public institutions and physicians of General Medicine, which caused the physicians to go on strike for the first time in Italy in 2017.

> *"At the beginning I collected the patients' authorization to create their profile and use the dematerialized medical prescription but it took me a lot of time to explain to patients how it works and to register their personal data. I also spoke with my lawyer and he explained to me that I am not in charge of collecting patients' personal data on behalf of care organizations. This requires time, re-sources and who will be in charge in case privacy issues will emerge?"* [Physician interview]

The tension between the parties was eventually released with the introduction of economic incentives. The Health Information Exchange platform is composed of a set of data and digital health documents of the citizens, which are generated by clinical events originating from hospitalization, outpatient specialist, pharmaceutical services, residential care, home care, access to First Aid and the Patient Summary. The medical information is available at regional level thanks to interoperable systems and at national level if care actors in different regions use similar technological devices.

Benefits of HIE platform for multiple stakeholders

The implementation of a digital platform on top of a digital infrastructure brought benefits at different levels.

Benefits at individual level: patients

In case of medical need, the patient opted for a medical visit. Before the HIE adoption, a patient in medical need often had to wait in a long queue due to physicians' overbooked agenda and increasing number of patients. As a result, patients with a full-time job often needed to request extended absence permissions from work to go for a medical visit or for administrative activities such medical prescriptions' renewal or bringing the results from specialized visits.

> *"I have to wait long time in queue before entering the doctor's office even if I fixed an appointment. If you don't work maybe this is not a big deal, but if you have a job and take care of your family then you have limited time frame for renewing a medi-cal prescription or receiving the medical suggestions for the next steps. You cannot spend your time in long queues especially for bureaucratic purposes"* [Patient interview]

The digital health projects in northeastern Italian region aimed at solving the problem of time waste especially for administrative purposes, with the creation of dematerialized prescription as part of the HIE platform. This provides the following benefits:

- Avoid long queues for the physician of general medicine;
- Respect the fixed time of the medical appointments;
- Separate the clinical needs treated by the physician from the administrative process performed by secretary;
- Patients will take work permissions mainly for medical visits and perform the administrative tasks at a convenient time for patients;

- Receive the medical prescription to pick up the medicine from the pharmacy with-out wasting time. For chronic diseases, the patient can send a request [via email, phone call, text message, or social apps] to the personal physician to receive the medical prescription online.

Benefits at group level: physicians

As physicians oversee patients’ care path, they are required to record any activity done. Prior to the HIE implementation, more than 50% of the office hours of the physicians are devoted to bureaucratic work instead of treating a health disease.

> *“Our primary job is to treat patients and this takes 100% of our working time. But we dedicate 50% more than our work of medical visits to the bureaucracy. If our work was a 100% before, it is now 150% because the bureaucracy continuously increases. I did not study the entire of my life and made many sacrifices to do administrative work but to help patients to cope with health problems”* [Physician interview]

The HIE usage helps physicians to be free from overabundance of paper that will distract from medical diagnosis and treatment. The main benefits experienced by physicians are the following:

- Reduce unnecessary queues in outpatient treatment, no longer print the pharmaceutical reminder, thereby lowering expenses, and store the information in digital archives;
- Simplify the Medical Prescription Management and have a comprehensive over-view of patients' health records;
- Improve the physician-patient relationship by increasing time for medical treatment while reducing administrative time.

Benefits at group level: pharmacists

Pharmacists receive the medical prescription digitally via mHealth, patients’ personal health card and white memorandum in case the patients require a paper confirmation of the prescription. This increases the time delivery of the medicine and more opportunity for talking with the patient. Additionally, the platform facilitates pharmacists in requesting the reimbursement from the Ministry of Health and Finance in line with the national laws. The increased connectivity is particularly valuable for maintaining a financially sustainable health ecosystem.

> *“When the patient arrives at the pharmacy and has the medical prescription we [pharmacists] have the identification code by entering the medical prescription data in our operating system and we go to capture the prescription that exists in the*

> *health system. From there we see the prescription and manage to give the drug to the patient" [*Pharmacist interview]

Prior to the dematerialized prescriptions, physicians hand or digitally wrote the prescriptions without automatic check for the correctness of the patients' personal in-formation or the specific name of the medicine. If the pharmacist did not find all necessary information to proceed the prescription and deliver the drug, s/he was not able to complete the process and resend the patient back to the physician. This meant time and resources consuming because the paper of the medical prescription was printed only by the Ministry of Economy with increasing annual costs. The HIE platform solved this problem and brought valuable benefits such as:

- Read the medical prescription digitally and manage its delivery without paper waste;
- Spend less time in understanding the content of the medical prescription and spend more time in speaking with the patient;
- Save some time in the pricing phase because the digital data is already uploaded
- Send all the data in the accounting list to the Ministry of Finance and Healthcare more easily to receive the reimbursement.

Benefits at organizational level: care organizations and accredited hospitals

Care organizations meet patients in moments when they are emotionally and/or physically hurt. In critical situations patients may not remember their own personal medical history such as specific allergies or specific treatments they had in the past. The availability of medical data without physical or temporal constraints is valuable to provide a care path. The main benefits experienced by care organizations include:

- Offer services within data centers;
- Strengthen the existing network of links between health care facilities;
- Implement the patients' medical history with new information and upload the results of specialized medical visits.
- Benefits at national and regional level: Ministry of Finance, Ministry of Health and northeastern Italian region

The collection of data real time through digital tools increases the transparency and accuracy of aggregated data. Each medical service directly involves multiple actors thus requires multiple transactions to register the entire process. If we multiply these transactions by the number of northeastern Italian regions’ population, regional and national institutions have to deal with big data for management and monitoring purposes. The HIE plat-form enables public institutions towards:

- Better administrative control;
- Collection of data that helps understand the trends of “need for medical health" at a territorial level;
- Bringing health services closer to the needs of citizens and health professionals;
- Analyzing the medicines consumption in relation to certain variables such as age, sex, geographical location.

The implementation of the HIE platform and supporting infrastructure produced expected benefits. However, it also resulted in unexpected changes and consequences, which we discuss in the following section.

Lessons learned from connecting data and actors through a multisided digital platform

Health Information Exchange platform developed in northeastern Italian region is not just a digital folder that collects medical documentation and information of each patient but it aims at a more ambitious mission: create a structure that enables the activation of tailored digital services for a wide range of ever-changing healthcare needs.

During the first few meetings among regional decision makers, it has been found that common health services such as medical prescriptions, electronic healthcare records with individual software were decentralized and redundant across healthcare organizations. Digital technologies were seen as solutions to cope with this common problem through an increased connectivity among care actors. This idea further evolved and is creating a structured cloud of data that collects and shares medical information across the ecosystem. Thus, connective technologies changed working practices to improve the quality of the regional healthcare system. In the digitalization rush, valuable lessons have been collected, which we discuss in this section.

1. The role of incentives for platform participants and users’ engagement

One challenge of the HIE platform usage is to engage all users in order to exploit the potential of the digital platform and create the network effects. Education programs to increase the digital literacy helped boost users’ confidence with the digital tool. Economic incentives were provided to important factors such as physicians of General Medicine to comply with new technological requirements.

2. Centralization of shared services for greater efficiency

When the logic of competition between care organizations of the same region started to be replaced with cooperative agreements, the decentralized services needed to be tackled to increase an economy of scale. The holding institution established in the northeastern Italian region centralized common activities such as the medical visits booking system, storage of patients' medical information of each department through Electronic Healthcare Records, medicine delivery with a mobile application. These centralized, shared services are now governed by a holding approach to meet the needs of different care departments and organizations. As a result, efficiency for those services has increased significantly.

3. Information integration to empower the organizations

Increased connectivity enables integration of previously fragmented care information. Integrated information empowers all care actors, including the providers as well as the receivers. When the care path becomes more clear and transparent, patients become more aware of their role in the care path. If the treatment does not bring the desirable results, they are empowered to do what is necessary to align their behavior with the desired path. At the same time, care providers become more attentive and coherent with the past decisions and future care treatment. Additionally, integrated information leads to more precise diagnosis and more streamlined care activities.

4. Complement the platform with mobile application

Once the digital infrastructure became reliable and stable, the consortium strategically made some digital services available to further improve care actors' engagement in the platform. For example, dematerialized medical prescription experienced a further evolution with the introduction of the mobile application. Its usage is on voluntary basis and in its taste phase because it is a one shot opportunity. This means that once the app is released, its adoption will continue if it is intuitive, flexible and easy to use. For this reason, the consortium is working on it to better calibrate patients' needs with the services it offers.

5. The mirroring hypothesis between the structure of a product development organization and the digital architecture of the platforms is not supported any more

The assumption of modularity does not hold for the entire digital ecosystem. Technical dependencies and tasks continue to mirror the structure of a project organization and the architectures of the items it contains. But the integrator systems in charge of coordinating and managing the entire network follows a solving-problem approach and every time develops a wider range of capabilities and expertise to cope with the new challenges. This means that healthcare is a technologically dynamic industry that tend to constantly change its technical dependencies and organizational ties to create new institutional arrangements as it happened with the creation on a new holding.

CONCLUSIONS

With the case of the northeastern Italian region's implementation of a HIE platform and supporting infrastructure, we have discussed the role of digital platforms in transforming the healthcare industry. The introduction of the multisided platform produced expected benefits as well as unintended consequences. The emergence of platformization and infrastructuring explains how organizational structures and work practices are co-evolving with connective technologies. The alignment of often-conflicting care actors' interests is crucial for sustainable efforts to increase connectivity among care actors. The lessons learned from this case can benefit similar platform projects in other regions or countries if they are taken with contextual differences in mind.

REFERENCES

Al-Dabbagh, B. N. (2015). The effect of ICT connectivity on individual work productivity: Investigating the influence of ICT self-discipline.

Al-Dabbagh, B., Scornavacca, E., Sylvester, A., & Johnstone, D. (2016). The effect of ICT self-discipline in the workplace. *arXiv preprint arXiv:1606.00894*.

Breidbach, C. F., Kolb, D. G., & Srinivasan, A. (2013). Connectivity in service systems: does technology-enablement impact the ability of a service system to co-create value?. *Journal of Service Research*, *16*(3), 428-441.

Barrett, M., Davidson, E., Prabhu, J., & Vargo, S. L. (2015). Service innovation in the digital age: key contributions and future directions. *MIS quarterly*, *39*(1), 135-154.

Cecez-Kecmanovic, D., Boell, S., & Campbell, J. (2014). Materiality of connectivity in the networked society: A sociomaterial perspective. Australasian Conference on Information Systems.

Constantinides, P., Henfridsson, O., & Parker, G. G. (2018). Introduction—Platforms and Infrastructures in the Digital Age. Information Systems Research, Articles in advance, 1-20.

Dery, K., Kolb, D., & MacCormick, J. (2014). Working with connective flow: how smartphone use is evolving in practice. *European Journal of Information Systems*, *23*(5), 558-570. Powell, A., Piccoli, G., & Ives, B. (2004). Virtual teams: a review of current literature and directions for future research. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, *35*(1), 6-36.

de Reuver, M., Sørensen, C., & Basole, R. C. (2017). The digital platform: a research agenda. *Journal of Information Technology*, 1-12.

Espinosa, J. A., DeLone, W., & Lee, G. (2006). Global boundaries, task processes and IS project success: a field study. *Information Technology & People*, *19*(4), 345-370.

Gabutti, I., Mascia, D., & Cicchetti, A. (2017). Exploring “patient-centered” hospitals: a systematic review to understand change. *BMC health services research*, *17*(1), 364.

Kaschig, A., Maier, R., & Sandow, A. (2016). The effects of collecting and connecting activities on knowledge creation in organizations. *The Journal of Strategic Information Systems*, *25*(4), 243-258.

Kolb, D. G. (2008). Exploring the metaphor of connectivity: Attributes, dimensions and du-ality. Organization Studies, 29(1), 127-144.

Kolb, D. G., Caza, A., & Collins, P. D. (2012). States of connectivity: New questions and new directions. *Organization Studies*, *33*(2), 267-273.

Kolb, D. G., & Collins, P. D. (2016). Managing personal connectivity: Finding flow for regenerative knowledge creation. In *Personal knowledge management* (pp. 151-164). Routledge.

Küpers, W. M. (2013). Embodied transformative metaphors and narratives in organisational life-worlds of change. *Journal of Organizational Change Management*, *26*(3), 494-528.

Loeschner, I. (2016). *Understanding peripheral work connectivity–power and contested spaces in digital workplaces* (Doctoral dissertation, The London School of Economics and Political Science (LSE)).

Middleton, C., Scheepers, R., & Tuunainen, V. K. (2014). When mobile is the norm: researching mobile information systems and mobility as post-adoption phenomena. *European Journal of Information Systems*, *23*(5), 503-512.

Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, 116-145.

Spagnoletti, P., Resca, A., & Lee, G. (2015). A design theory for digital platforms support-ing online communities: a multiple case study. Journal of Information technology, 30(4), 364-380.

Symon, G., & Pritchard, K. (2015). Performing the responsive and committed employee through the sociomaterial mangle of connection. *Organization Studies*, *36*(2), 241-263.

Waizenegger, L. (2015). Connectivity as a Two-Edged Sword: Mirroring the Multifaceted Field of Constant Connectivity. In *Wirtschaftsinformatik* (pp. 1527-1541).

Waizenegger, L., Remus, U., & Maier, R. (2014). Connectivity Changes: Why Do Project Team Members Shift between Different States of Connectivity?.

Waizenegger, L., Thalmann, S., Sarigianni, C., Eckhardt, A., Kolb, D., Maier, R., & Remus, U. (2016). From isolation to collaboration-how the increasing diffusion of mobile devices has changed practices of knowledge sharing in non-office settings.

Yli-Kauhaluoma, S., & Pantzar, M. (2018). Seeking connectivity to everyday health and wellness experiences: Specificities and consequences of connective gaps in self-tracking data. *Digital health*, *4*, 2055207618779714.

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science*, *18*(5), 749-762.

Zwikael, O., & Smyrk, J. (2012). A general framework for gauging the performance of initiatives to enhance organizational value. *British Journal of Management*, *23*, S6-S22.

FINAL CONCLUSIONS

It is worth pondering intended, unintended and major benefits of digital technologies implementation in care settings. The consequences experienced by different care actors questions current understanding of the value added when compared with negative outcomes. This thesis analyzed the case of a northeastern Italian region engaged with the digitalization of care services for improving the quality and hopefully lowering the costs. Four category of actors, patients, pharmacists, physicians and technology implementors shared their experiences and impressions of the new technologies adopted and their effects on regional care system. The thesis is part of a broader research project and composed of three research papers.

First, I conducted a literature review about mobile health applications and its impact on patient empowerment. It has reviewed the definitions of patient empowerment and mobile health, discussing their main benefits and challenges. In this sense, it can provide common ground on which the academic community and stakeholders can build. I argued that the success of the "*mobile health revolution*" will depend on the extent to which the use of mHealth products and services lead to better health outcomes at lower costs for the population.

Based on the analysis of the literature review, I provided evidence that the concept of empowerment has been considered in different contexts and at different levels of analysis. This paper provided evidence that technology is considered an initiative which is brings benefits to patients, care teams and organizations. But at the same time, prior studies highlighted the fact that empowerment is not universal but it depends on the context, time and people. The technology implementation does not guarantee an automatic success. Indeed, this review showed that empowered initiatives hold a double edge outcome depending from which perspective they are observed. However, when the technology is poorly implemented and when empowerment initiatives are not perceived this leads care actors to avoid the use of the available digital technologies and also to backfire and a false progress.

In the second paper, a research team investigated consequences of digital platforms' and mobile applications' implementation, with a specific focus on unintended outcomes. We provided evidence of the perception of four care actors namely patients, pharmacists, physicians and IT implementers related to the Health Information Exchange platforms implementation. We argue that one of the reasons that the advanced technologies in care settings is poorly used is due to a poor understanding of the unintended outcomes. Therefore, our focus was to capture whether the set goals have been achieved and which other results emerged. This paper contributes to the affordance theory and unintended consequences by deepening our understanding of the role of digital platforms in changing the ways care services are delivered. This helps policymakers to understand and to minimize the dysfunctional side effects of digital initiatives to increase the success of implementation of digital platforms in healthcare, which is composed of actors with often-conflicting interests. Through the combination of theoretical perspective of affordances and the data analysis, we shed light on the IT affordances that support the technology implementation. We highlighted digital technologies afford the process of patient empowerment to meet the necessities of patients during their care path and at the same time make them more aware and responsible of their role

The third paper presented new trends of platformization and connective flows in the healthcare industry in a northeastern Italian region. I highlighted the clinical and organizational needs that stimulated the rush towards the digitalization in Italy as part of European initiatives. I presented the case study of a consortium, which is working for connecting multiple actors with often-conflicting interests though a digital multisided platform in a northeastern region. I discussed the benefits of an organizational transformation of the regional health ecosystem. To conclude, I shared the lessons learned and suggested the policy implications of Health Information Exchange usage.

To conclude, I highlighted how the use of an EHR can change the relations and power in the care service delivery. In a short time, frame trust and reputation can slowly switch from one level to another. These findings contribute to our knowledge on how capture the technology added value from unintended outcomes and to improve further the digital health ecosystem from different perspectives. Moreover, designers of digital health ecosystems will acquire insights on what are the unintended changes of the EHR implementation and how those changes affect the actors involved in the ecosystem to better calibrate the digital affordances with end-users' needs and effective use. I believe that a coordinated collective effort is mandatory to promote digital health education, engagement and to protect data privacy and security of patients' information.