The effect of digital technologies adoption in healthcare industry: a case based analysis

Elena Laurenza
*Management Studies and Quantitative Methods,
University Parthenope, Naples, Italy*
Michele Quintano
*ESADE Business School, Barcelona, Spain and
ESADE Business School, Madrid, Spain*
Francesco Schiavone
*Management Studies and Quantitative Methods,
University Parthenope, Naples, Italy and
Strategy and Management, Paris School of Business, Paris, France, and*
Demetris Vrontis
School of Business, University of Nicosia, Nicosia, Cyprus

Abstract

Purpose – The purpose of this paper is to contribute to the extant literature regarding the exploitation of digital technologies by illustrating how this type of IT can influence business process improvements in the healthcare industry.

Design/methodology/approach – The paper reports an illustrative case study for MSD Italy, the Italian subsidiary of the USA-based company Merck & Co., Inc. The group sells drugs for human use in Italy but is also active in the veterinary (MSD Animal Health) industry, with Vree Health, and in solutions and software-based services for the healthcare industry.

Findings – The results show that the adoption of digital technologies could improve the performance of main healthcare business processes, particularly those processes that can be simplified with the adoption of information technology. More specifically, digital technologies could increase efficiency and, at the same time, allow for the delivery of better quality and reduced response times, with many benefits for several stakeholders, such as national health systems, clinicians and patients.

Originality/value – Although some studies report the need for effective business processes for sustainable healthcare systems, there is a lack of literature regarding the specific implications of the adoption of such digital technologies for the business process management of healthcare firms. This paper attempts to fill in this gap.

Keywords Digital technologies, Business process management

Paper type Research paper

1. Introduction

The life span is increasing, technologies are being perfected, and medicines are spreading at extraordinary speed. The benefits are undeniable, as are the problems and questions. The evolution of healthcare is primarily the evolution of a thought pattern: health should be seen as a social and economic investment, a driver of growth that produces circular well-being among those who provide technological equipment (companies), those who use it during emergencies and routine care (hospitals and the medical profession) and those who benefit (the patients). The starting point is the cost, human and economic: healthcare is sustainable if business models that increase service quality do not inflate expenses already at the limits of their availability. The challenge is complex, given the growing demand for assistance in terms of numbers (patients) and technological innovation (new services, new treatment methods and monitoring).

There is a consensus among practitioners, policy-makers and researchers that current healthcare systems are not sustainable. The increasing average age of the population and chronic disease, combined with rising expectations, has caused costs to rise.

In the last decades, there has been the failure of public utilities model in general, above all due to a widespread perception of dissatisfaction by citizens-customers toward the services received by public service providers. Such dissatisfaction has been determined by a higher cultural level of users and by the comparison between service quality levels offered in "market" and levels of service quality offered by monopolistic public companies, as well as by innovation of the technological framework that allows overcoming the traditional operating conditions (Dezi *et al.*, 2006).

Many experts assert that reforms are needed and that healthcare systems could be more efficient and effective with greater employment of digital technologies, allowing the sharing of information beyond organizational boundaries (Department of Health, 2008; Christensen *et al.*, 2009). Such technologies, however, have been difficult to implement, although they can support transformations in the way care is provided. This use implies a deep understanding of how these technologies could change the healthcare industry. Currently, studies on the topic have mostly focused on the way work routines and business models are changing and, in particular, on disruptions to traditional workflows that reflect provider-centric models of care (Ford *et al.*, 2017; Currie and Finnegan, 2011; Westbrook and Braithwaite, 2010).

The technological innovation, more specifically the digital revolution, is deeply changing the way healthcare processes are managed, promoting cooperation among several healthcare players. Healthcare processes and healthcare organizational performances strongly rely on both information and knowledge sharing (Kim *et al.* 2012; Lenz *et al.*, 2012; Lenz and Reichert, 2007). Therefore, information management could play an important role, and technology to support these processes becomes crucial, as well as there is a need to get more insights about the link between contingent factors, informational and communicational systems and firm's efficacy (Del Giudice and Maggioni, 2014).

At the same time, healthcare organizations are faced with the growing complexity of care, reduced resources and increased regulative frameworks. Healthcare providers are trying to increase quality and, at the same time, reduce costs to maximize value. Providing care for a medical condition often requires multiple areas of expertise and several interventions. Value for the patient is created by the combined efforts of providers over the full cycle of care (Porter, 2010). Process management could simplify services and processes, making them more efficient while delivering better quality and reducing response times.

In general, the environment, has not only the function of a center for industrial activity and the physical resources employed by industries, but becomes the place for the production of immaterial factors and knowledge, which produces processes of generation and the diffusion of innovation (Carayannis *et al.*, 2017).

Therefore, the enormous changes in the healthcare environment are laying the foundation for a new business model, and this shift from volume-oriented organizations to value-oriented organizations involves performance management in health care, which is moving from an outcome-based approach to a system-based approach (Buttigieg *et al.*, 2016). More specifically, clinicians and managers are paying more attention to processes to obtain better health system performance. Health care organizations are more frequently employing business process management (BPM).

In all other industries, the use of BPM has become crucial to achieve higher competitiveness through improved processes that can add value (Weber *et al.*, 2010). However, compared to that in manufacturing industries, process management in health care is behind, even though it seems necessary to improve the quality of care. Furthermore, the health care industry is facing challenges that make it necessary to adapt these processes (Rebuge and Ferreira, 2012). Historically, within health care applications, BPM is regarded

as a tool to enhance processes with the aim of increasing the quality of health care delivery systems, starting from the application of total quality management principles, followed by continuous quality improvement (Kenyon and Sen, 2015) with the application of six sigma, with a limited overall effect with small-scale improvements that were not sustained (Liberatore, 2013). More recently, diminishing waste in organizations has become a necessity, promoting the use of techniques able to measure, improve and control process quality (Näslund, 2013).

Using software applications in ICT has totally revolutionized the way that processes have been implemented into organizations, and previous studies have showed a positive and significant relationship between the use of specific ICTs, such as ICTs information orientation, communication orientation and workflow orientation, and the innovation performance of SMEs (Scuotto, Del Giudice, Bresciani and Meissner, 2017; Scuotto, Santoro, Bresciani and Del Giudice, 2017).

We contribute to this stream of research by analyzing opportunities provided by digital technologies for the healthcare industry. More specifically, starting from the way new business models are changing in the healthcare industry, we explore how a larger use of digital technologies could support process management in the healthcare industry as an important and integrated part of business models.

In particular, the study aims to answer the following research question:

RQ1. How do digital technologies improve clinical healthcare processes?

Therefore, health informatics has established itself as a crucial element in the delivery of quality health care by improving healthcare processes.

The paper proceeds as follows. In the second section, we examine the evolution of business models in the healthcare industry, highlighting how life sciences companies, including pharmaceutical, medical device and diagnostic companies and health services providers, have been compelled to review their value proposition in the market to adapt to the shifting requirements of their consumers. In the third section, we focus on integrating healthcare business models; on the implications of adopting digital technologies for BPM; and on the need for healthcare players to simplify services and processes, making them more efficient and delivering better quality and shorten response times. In the fourth section, we describe the approach employed in the analysis. In the fifth section, we report the case examined, MSD Italy, which can be defined as a new health digital company. In the final section, we report the conclusions and managerial implications.

2. Process management in the healthcare industry and new digital technologies

The concept of business processes is often analyzed to make organizations more efficient (van Rensburg, 1998), as it is considered as one of the main elements to be leveraged to enhance an organization's performance. Studies about business processes give several definitions for the concept (Pritchard and Armistead, 1999; Larson and BjØrn-Andersen, 2001). One of the definitions most employed is that of Davenport and Short (1990), who have defined a business process as the whole of logically related activities performed to realize a determined business output. A definition focusing on the client-centered aspect of business processes is the definition provided by Hammer and Champy (1993), which states that business processes are a set of activities that needs several types of input and realizes an output of value to the consumer.

BPM is a field of knowledge resulting from the match between management and information technology, and it includes all resources: humans, organizations, applications, documents and others (Fink and Grimm, 2008). For these reasons, BPM has become a pervasive concept to be considered as a systemic method for understanding, analyzing, executing and changing business processes and all resources related to an organization's

capability to create value. It has become important because organizations are recognizing the necessity for a growing process orientation to improve the value of their businesses (de Bruin and Rosemann, 2005). However, the freedom to change organizational structures and remove activities unable to add value from core business is necessary for success.

In the healthcare industry in particular, this freedom is greatly limited because of the large variety of regulative frameworks that managers are faced with, reducing their freedom to re-examine the organizational structure to remove non-value-adding activities (Becker *et al.*, 2007).

At the same time, healthcare organizations, more than others, are faced with the growing complexity of care, reduced resources and increased regulative frameworks. Healthcare providers are trying to increase quality while reducing costs to maximize value (Helfert, 2009).

Therefore, process management aims to simplify services and processes, making them more efficient while delivering better quality and reducing response times. In the USA, for example, patients' length of stay in the hospital has been reduced by 33 percent thanks to the introduction of clinical process management (Buescher *et al.*, 2004). These are motives for utilizing health process management as an important strategic task for all healthcare players.

After all, healthcare processes are complex; they include clinical and administrative tasks, large amounts of data, and many patients and stakeholders. Medical processes need to be planned; appointments must be organized; and the physician's notes and documents have to be written, transmitted and evaluated (Lenz *et al.*, 2012; Lenz and Reichert, 2007). Therefore, collaboration between players is crucial. Manual coordination, however, could lead to organizational and administrative problems that cause long wait times for patients, cancellation and re-scheduling of appointments and consequential loss of time. For all these reasons, healthcare systems need support for such cooperative processes, and an important solution could stem from digital technology.

As with other service firms, healthcare companies and organizations invest in information technology to enhance service performance (Froehle and Roth, 2007) in terms of cost reduction or care quality improvement. The use of technology, IT in particular, is new to the healthcare industry, especially compared with other industries (e.g. financial services, travel or retailing); therefore, literature regarding healthcare technology and process management is lacking. Researchers have studied the relationship between capital investment for technology and business value in the areas of operations management and manufacturing flexibility (Anand and Ward, 2004; Gaimon and Morton, 2005), computer-integrated manufacturing technology (Groover, 2008), and enterprise resource planning (Hendricks *et al.*, 2007), and a more recent study investigated ways of sharing knowledge and cloud computing tools used in the organization to manage knowledge (Rathi and Given, 2017).

Clinical processes are often distinguished between organizational and medical treatment processes (Lenz *et al.*, 2012; Lenz and Reichert, 2007). Organizational processes deal with procedures such as medical order entry and result reporting, which require cross-departmental healthcare communication and a number of integrations and interoperability standards. Medical treatment processes deal with procedures involving diagnosis and therapy and, consequently, observation, reasoning and action.

In this context, an important role in the improvement of healthcare processes is played by technological innovation. If healthcare providers must rely on paper, the sharing of information could be difficult, with significant and negative consequences for the management of vital knowledge of the patients' health history. Conversely, the healthcare industry could instantly share clinical information and diagnostic results with colleagues in the same building or across the country or continent electronically (Omachonu and Einspruch, 2010).

Digital innovation could provide crucial capabilities for all healthcare players: patients could immediately access their own clinical information to transfer them from one healthcare organization to another (Länsisalmi *et al.*, 2006).

Moreover, new digital technologies, nanotechnology and genetic engineering are radically transforming the health care industry, invalidating old assumptions and creating new perspectives for innovation and improvement of business processes (Govindarajan, 2007). Many innovations in the healthcare industry are aimed at improving life expectancy and quality, diagnostic processes and the efficacy and efficiency of the whole healthcare environment (Mosadeghrad, 2014), including innovations in care delivery processes, medications and surgical interventions.

Internet-based innovations are one example of how technology could advance healthcare, changing the way people exchange health information (Tzeng *et al.*, 2008), and healthcare solutions are changing with the diffusion of internet technologies.

First, the internet permits access to healthcare information and services on particular illnesses, treatments and health management (HIMSS, 2003); it also allows for the improvement of the medical practice thanks to the constant monitoring of health conditions through several digital tools to increase the sharing of information between patient and physician, therefore supporting clinical decision and disease management. Moreover, the adequate use of data analysis tools in healthcare organizations could influence decision-making effectiveness, obtaining valuable knowledge (Wang and Byrd, 2017). Another critical aspect is the most recent employment of information and communication technologies, from the internet to mobile computing, that have introduced a new e-health innovative application, m-healthcare. "mHealth" is a new social health care model aimed at the overall health of the citizen-patient, stimulated and implemented through a "strong" citizen/patient proactivity and realized through the use of mobile devices and multi-channel technology, such as mobile phones, smartphones, patient monitoring devices, personal digital assistants (PDAs) and other wireless devices (World Health Organization, 2011).

mHealth also includes the world of apps related to health conditions and life-style, and it can be extended to so-called Health IoT (Internet of Things), that is, to the world of surveys of biosignals and/or bioimaging resulting from access to medical devices or other sensors, as well as systems that provide information on health or reminders via SMS.

For example, mobile technologies are capable of enhancing health care processes and giving support to health care professionals (such as in diagnosis or patient management) or facilitating communication between health care professionals and end users (i.e. reminders and test results).

Mobile technologies offer an important opportunity for improving health care processes because of their popularity and mobility (Free *et al.*, 2013). The great mobility of mobile devices has important implications: the possibility for people to carry their phone everywhere allows real-time communications able to reach a patient or to deliver interventions at any time and any place. One of the newest e-health applications is m-healthcare, defined by a number of mobile technologies adopted in healthcare environments: wireless network technologies, mobile computing and handheld devices (Tessier, 2003). m-Healthcare offers a great opportunity to increase the amount of e-healthcare applications available (Meneghetti, 2013; Smaling, 2003).

According to a recent study (AISIS, 2014), clinical processes can be greatly improved by the adoption of e-Health. The order entry process in the presence of mobile technologies starts from the request by clinicians and/or nurses for the services needed for diagnostic deepening. It occurs in different circumstances: on rounds or in response to changes in the patient's medical condition, with the use of a mobile device, during the discussion of clinical cases, or via a mobile or fixed station.

The order entry is integrated with the hospital information system to provide the exact situation of admissions to the convalescence ward.

Therefore, e-health requires mobile users, and devices are employed to collect, transfer and elaborate patients' information in real time. These procedures are particularly important for remote monitoring of home patients or to ensure access to medical information in a mobile and ubiquitous setting (Bergenti and Poggi, 2009). This access could allow for the collection of patients' medical information for use by healthcare practitioners, particularly for those involved in telemonitoring a patient's health conditions at home.

More specifically, telemonitoring patients at home is one of the most crucial applications within the field of e-health (Jankowski *et al.*, 2017; Meystre, 2005). In fact, telemonitoring allows healthcare organizations to monitor the therapies of their patients and to activate services in case of a health emergency through the constant monitoring of health conditions. Moreover, it can provide other services such as assistance, information and communications services, which drive the adoption of multi-agent systems for the realization of telemonitoring applications (Bergenti *et al.*, 2016; Rialle *et al.*, 2003). For example, one of the most interesting initiatives that use multi-agent systems is SAPHIRE (Laleci *et al.*, 2007). SAPHIRE (Laleci *et al.*, 2007; SAPHIRE, 2017) is a project aiming at developing a multi-agent system for the monitoring of diseases both at home and at the hospital. The system allows for the deployment and execution of clinical guidelines through the inclusion of fragmented information from several providers. The automation of clinical guidelines support monitoring and medical decisions through the development of computer models that are executed by several software agents, while the access to medical data occurs through semantically enriched Web services (SAPHIRE, 2017). The constant monitoring of clinical guideline execution occurs through user-friendly graphical interfaces supported by mobile and Web-based mechanisms for healthcare professionals. The project has been applied in two pilot applications: for the monitoring of cardiovascular patients in the Emergency Hospital of Bucharest in Romania and for the homecare monitoring of cardiovascular patients in Schüchtermann-Klinik in Germany.

Furthermore, an important critical factor that is revolutionizing the conceptual architecture of healthcare systems is the second incarnation of the Web, Web 2.0 (Boulos and Wheeler, 2007), called the "social Web" because it allows for easier and more democratic publication of content by users. Web 2.0 also facilitates online social interaction (Beldarrain, 2006) with a higher degree of interactivity and group interaction.

The diffusion of knowledge sharing technologies, such as the social network, have determined the removal of previous communication network with new and more sophisticated means of interaction that do not integrate existing deeper structures (Del Giudice *et al.*, 2015).

Similarly, Web 2.0 can offer many opportunities for health care participation due to the access to practice-specific knowledge. Patients and healthcare players can access electronic records, which increase information exchange, communication and collaboration between several actors while enhancing healthcare outcomes and reducing costs. Furthermore, social networking services allow users to share information and knowledge within a network of players, linking users and physicians to each other. The health care system is community oriented, reaching beyond the boundaries of organizations, and it includes the way knowledge is shared between clinicians, with their patients and with other players in the healthcare system (Antonacci *et al.*, 2017; Barsky and Purdon, 2006). These new technologies have created challenges for health care organizations but have also provided opportunities to make deeper connections with their stakeholders, clients and supporters, including clinicians, patients and laypersons.

Thus, ICT offers the opportunity to promote and support the active participation of people in their health management by maximizing the information flow between individuals

and clinicians, thus allowing the possibility of providing individualized medical services based on personal data. To empower people to participate in health services production, a network and service infrastructure whose function is to support the realization of personalized, flexible and secure services incorporating resources in a holistic seamless ecosystem is required (Karatzanis *et al.*, 2012). These infrastructures should support the Internet of Things by combining devices, communication and delivery services (Spanakis *et al.*, 2016).

Bianchi *et al.* (2016) developed a framework to explore the applicability of an IT self-servicing app in the treatment of patients. The model combines seven categories of self-servicing IT apps and eight patient process steps. As a result, they concluded that there are positive effects such as reduced waiting time, real-time notification, the possibility of self-monitoring and self-treatment. It also included an easier appointment system due to the self-servicing IT apps for both the medical staff and patients, from the phase of the "information help desk" to the final phase of "patient check-out."

A more recent study (Desmedt *et al.*, 2017) shows that health information technology should be developed to promote integrated care by providing patients with autonomy and supporting self-management. Moreover, health information technology could create conditions to enhance patient safety through the integration of competences and responsibilities of the healthcare personnel. However, this could work only when well implemented and when advanced health information technologies are adopted.

3. Methodology

This paper is based on a qualitative approach employing the case study method. The case study has become one of the most used qualitative methods in technology management research and information systems studies (Myers, 1997; Myers and Avison, 2002; Benbasat *et al.*, 1987). The case study research method is appropriate when the form of the research question is "how" because it allows for the gathering of better knowledge and a deep understanding of a complex problem since it considers social processes and knowledge regarding managerial complexity as they occur in practice. According to Eisenhardt (1989), we have reviewed the contributions on the topic and have chosen the methodology (Miles and Huberman, 1984) that best fits our aim, which is to answer two main questions related to the significant changes in the healthcare industry (Yin, 2009).

The study develops an illustrative case study by employing secondary data collected from documentation and archival records contained in official websites, company reports and articles from professional magazines and journals. Both official reports and professional and scientific documents were considered.

As a base for the case study, several e-Health companies providing digital services supporting healthcare systems were analyzed. Finally, the company's main features were defined: the variety of services delivered and the conformity with new health digital traits, an innovative business model describing organizations redefining the meaning of healthcare services, by deploying technologies, networks and infrastructure to healthcare and care in general, focusing their strategies on digitally powered activities and entering the healthcare market by exploring opportunities offered by the gaps in new digital solutions for patients and providers (Elton and O'Riordan, 2016).

The company analyzed in the illustrative case study is MSD Italia, the Italian subsidiary of Merck & Co., a multinational pharmaceutical company founded 125 years ago and a world leader in the health industry.

In particular, we analyze the portfolio of services provided by the company, which include a wide range of products and services, including medicines, vaccines, biologic therapies, health products for animals and innovative health solutions.

3.1 Research design

The aim of the empirical research requires the observation and examination of several aspects, such as the comprehension of healthcare clinical processes, the adoption of digital technologies, and the way that new technologies can support the effective operation of clinical processes by making them more efficient while delivering better quality and reducing response times.

To better describe the case, we utilized the following steps.

First, we try to identify the actors involved in delivering the healthcare services: general practitioners, specialists, pharmacists and end users. In the healthcare field, organizational tasks often burden the work of physicians, nurses and technicians. There is a great need for planning and preparation of medical procedures; scheduling of appointments with service providers; arranging physician visits from diverse departments; and writing, transmitting and evaluating reports. In other words, cooperation between people from different fields is a crucial aspect. Therefore, we believe that it is important to understand who the people are who are operating within the case analyzed, how much they are involved in clinical processes, and how they collaborate.

The next step involves the data collection. Archival documentation was the main source of data used in the research. Studies, reports, meetings and conference documentation, proposals, newspaper articles, and books were reviewed and analyzed. Information was collected regarding the digital tools and instruments used to increase accessibility for all healthcare services users, as well as information about the nodes of the digital ecosystem of the company. We conducted an in-depth examination of the events experienced by the company, by providers, the community, etc.

Sources of data:

- www.msd-italia.it/

- www.msd-italia.it/pubblicazioni/pubblicazioni.asp

- www.msdsalute.it/

- www.doctorplus.it/flusso_assistenziale.html

- www.vree.it/healthcare.html

- www.recentiprogressi.it/allegati/01740_2015_01/fulltext/10_Rassegna%20-%20De %20FIore.pdf

- forges.forumpa.it/assets/Speeches/19116/6_catalano_[modalita_compatibilita].pdf

- www.aboutpharma.com/blog/2016/10/27/aboutpharma-digital-awards-vincitori- della-quarta-edizione/

- www.doctorplus.it/aree_applicazione.html

- www.doctorplus.it/studio_clinico.html

- www.vree.it/doctor_plus_analysis.html

- marcominghetti.nova100.ilsole24ore.com/2015/12/21/il-settore-farmaceutico-puo- vincere-la-sfida-della-digitaltransformation-la-ricetta-di-sanofi/

- forges.forumpa.it/assets/Speeches/19393/co_01_nicoletta_luppi.pdf

In this work, secondary data from documentation and reports were analyzed through an inductive process. We identified the main nodes of the digital project to understand how and which tools are provided to healthcare professionals for clinical practice and to the innovative services for the management of patients' disease and how the case project has been expanding to people and the health environment. Through our analysis, we learned

how the project interacted with its organizational surroundings. Once implemented, the e-health project contributed to more than technology diffusion; it also played an important role in the management of clinical processes, aimed at improving the quality and efficiency of the healthcare services delivered. In the collected data phase, we also observed examples of how certain clinical and administrative tasks had been delegated to the project.

Then, we analyzed the clinical processes involved in the healthcare digital ecosystem: the measurements made by patients at home, the communication of such data through a digital dashboard, the storing of these data in a database available to clinician employees, the medical decision-making process according to the information received and the real-time monitoring of healthcare patients' conditions. We tried to understand how these processes can benefit from the adoption of digital technologies and to determine how the use of software, digital platforms and digital devices contributes to healthcare service improvements.

Thus, we have implemented a systematic approach to look at the collected data to reach a clearer understanding of what happened, why, and what was done about it.

4. Case study analysis

MSD Italy is the Italian subsidiary of the USA-based company Merck & Co., Inc. It has been present in Italy since 1956 through an integrated supply chain that provides investments in research, production and business activities. The company, through its prescription medicines, vaccines, biologic therapies, and animal health products, provides innovative health solutions, aiming to increasing access to health care. The group is active in Italy not only with the sharing of drugs for human use but also with the veterinary industry (MSD Animal Health), with Vree Health, solutions and software-based services for healthcare.

The company has built its identity on four fundamental pillars: innovation, which results in unique and distinctive projects and services with strong digitalization; customer centricity, or the will to put the customer at the center, whether it is a doctor, a patient, a pharmacist or any other player in the healthcare ecosystem; the community, as the context of where the company operates; and human resources.

In addition to large investments in scientific research, the company's innovativeness is also expressed using new media channels, new technologies and unusual forms of communication, such as film or music, as well as through the provision of cutting-edge services to support doctors and patients to improve their interactions.

MSD Italy has developed several kinds of digital instruments, including sites for pathology and medical products; educational sites for patients; applications for medical classes both for patients and for internal staff training purposes; and social accounts such as Twitter, YouTube, Pinterest and Instagram.

The approach to innovativeness is customer oriented, reflecting the attempt to make the customer part of the process in a different way through products, services, projects and tasks that respond to their advanced requirements. For these reasons, for the third consecutive year, the company has been awarded the Best Digital Company Award, reserved for the company that has created the most efficient digital strategy that is attentive to stakeholders' needs by strengthening and developing long-term relationships.

4.1 MSD Salute digital ecosystem to manage clinical process

Within the digitalization process, MSD Italia has introduced a new portal for the doctor, which is the MSD Salute, a virtual collection point for all digital services supporting the medical practice of general practitioners, specialists and pharmacists, which can be accessed through private credentials. The new hub account provides the following services:

- article request: the ability to ask for full text articles from over 200 international journals;

- laboratory analysis: a database of laboratory tests with complete units, reference values, descriptions and information;

- drug interactions: a database containing information on interactions, adverse events and drug dosages;

- editorials: discussion of scientific and legal articles and abstracts of the most relevant scientific articles;

- daily news: daily updates on science and health care;

- app/product and pathology websites: it contains the app catalog provided by MSD and direct access to the store and product and pathology websites; and

- MSD product list: all products marketed by MSD with pages dedicated to all products offered.

The new portal is also visible from all types of digital tools (PC, tablet, smartphone) to be easily accessible by all users and in line with technological innovations. It is also supported and promoted through the Twitter, LinkedIn and Periscope accounts (MSD Italy, 2017).

The company carries out communication campaigns that integrate traditional channels with web 2.0 tools and further diversifies their presence in the digital world by using tools such as the MSD Health Network Twitter account to interact with the community of health professionals (Figure 1).

The MSD Salute digital ecosystem is composed of several nodes:

- The Blended Model aims at adequately informing and training users while controlling participation in courses promoted at the corporate level through e-learning and promoting classroom courses locally tailored to the different business roles, which allow users to lower the compliance in the different business areas of specificity.

Source: Adapted from Forum dell'Innovazione per la Salute (2016)
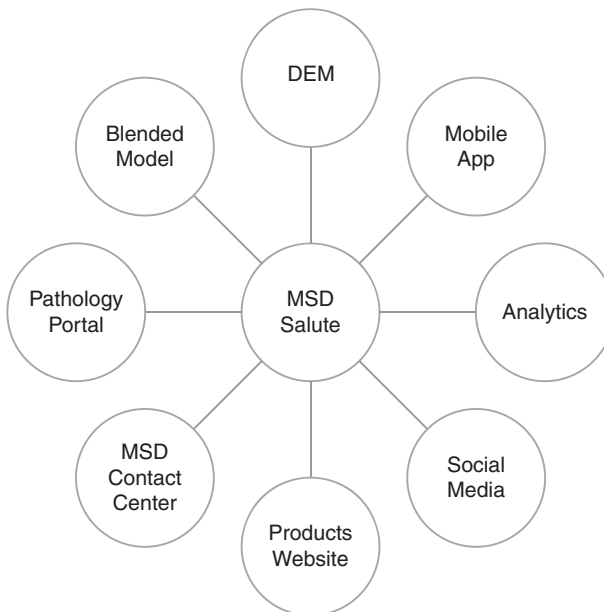
Figure 1.
MSD salute digital ecosystem

- The pathology portals provide solutions in many therapeutic areas, focusing on areas that need major research efforts, including oncology, virology, including both hepatitis C and HIV, diabetes, immunology, osteoporosis and acute care.

- The MSD Contact Center is the service dedicated to the management and the timely resolution of all the requirements for access to MSD Health, to corporate portals and to all apps made by MSD. It also supports the consultation of content, including the section regarding the request for scientific articles, as well as the activation of online meetings, forums and restricted areas and its technical support.

- The product website includes webpages containing information about pharmaceutical products commercialized by the company.

- Social media tools, such as Facebook, Twitter, YouTube, LinkedIn and Periscope.

- The analytics service is a laboratory test database complete with units of measurement, reference values, descriptions and information.

- Mobile app: the company developed over 22 apps dedicated to physicians and patients. They are for the clinical practice of medical instruments located directly on smartphones, or applications to support prescriptive pertinence.

- DEM is direct e-mail marketing containing medical information; starting with the launch of MSD Salute, the company has sent weekly e-mails and special editions focused on specific products or diseases.

The spread of smartphones and tablets is revolutionizing medical and scientific communications. This means the provision of tools to healthcare professionals for clinical practice and to the patient innovative services for the management of their disease. The idea is to make patients part of the process, working with them to develop products, services, projects and activities properly responding to clinical needs. This system increases the knowledge of the doctor through the information that customers give about their needs, attitudes and preferences to create a "tailor-made" service, updating medical-scientific and professional knowledge.

In addition, the main service developed by the company is Vree Health (Vree Health, 2017a), a telemedicine service designed to support the players in the health care system, focusing on the integration of the actors and fostering greater clinical efficacy and improved management efficiency, such as reducing improper access and promoting territory integration. The healthcare services of Vree Health are designed to combine ease of use and reliability as the result.

All services are based on a software for health care, designed to allow quick access to data and certificates of medical devices to ensure the reliability of clinical data.

4.2 BPM improvements in MSD Italy
The multi-channel approach adopted by the company does not represent only a pure technological exercise of "use of different channels" but serves as a real relationship strategy with users.

The strategy could be effectively realized due to the careful assessment of the target audience, services and information to be accessed; the type of relationship to be established with the user; the physical or virtual locations where the relationship occurs; and the technological tools available.

Through a multi-channel approach, it is possible to effectively address the growing need to communicate in any place at any time through several tools, and it has been possible, above all, to meet the different targets, therefore moving towards real service customization.

In addition to delivering general information on the health services provided, the totems have allowed citizens to independently and safely access innovative electronic health functions and services. The whole process was accompanied by the introduction of organizational changes (processes and skills) and the adoption of change-management policies (communication plans, training plans, customer satisfaction surveys). The development of a real-time web-based monitoring system is an integral part of this process for the release of various functions and various channels of the platform. A dashboard to observe and study the behaviors and "habits" of users promptly intercepts failures and malfunctions of systems, evaluates the popularity of the various functions available, and introducing continuous improvements and new services while constantly maximizing the performance in the field and on user interfaces.

Therefore, the company provides a care pathway adaptable to the needs of individual customers (Figure 2).

The first phase of the service provides support to the doctor in the stratification of patients most at risk based on their medical history.

Subsequently, the service helps clinicians in identifying and training the most suitable patients to offer the service. These patients are given a certified medical device kit to perform simple measurements directly from home. Patient values are monitored constantly by an operations center, composed of specialized nurses who, on the basis of a shared clinical protocol, intervene if alert clinicians occur and fulfill a coaching and training function to support patient empowerment.

Doctors become involved when their expertise is required, and above all, they are able to see, directly from the management software, the clinical data on their patients on a daily basis.
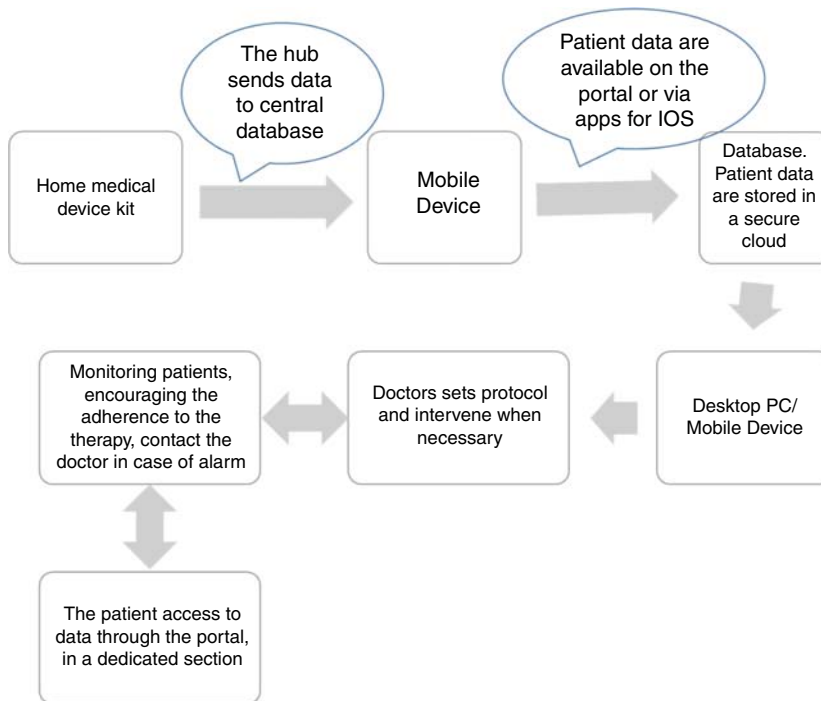

Source: Adapted from Vree Health (2017b)

Figure 2.
Healthcare workflow

The main benefits are the rational employment of specialist resources; the territorial extension of specialist skills with continuing learning opportunities for generic and nursing medical staff; saving of economic resources (ambulances, clinics, costs induced by the patient); standardized information and data management, establishment of centralized databases for epidemiological and statistical studies; greater uniformity of medical treatment through a capillary and effective application support for homogeneous protocols management; events tracking and monitoring, with the consequent increase in the efficiency of systems analysis and validation of the treatment protocols employed at the local, regional and national levels; transfers the reduction of patients who need specialist advice, limiting them to those cases requiring surgical treatment; and reduced risks related to the transport of patients.

5. Discussion

The case of MSD Italy offers interesting insights within new healthcare business models and new way of management business processes.

MSD Italy provides remote support services for the management of patients with chronic diseases to local health units and private clinics and more generally to organizations and institutions, the National Health System and private customers. The management model includes providing health organizations with primary care services, social assistance and social health for patients enrolled in these telemonitoring programmes. Services are provided to companies employing medical devices. In particular, the services are addressed to home telemonitoring management and to educational support for parameter clinical control (such as blood glucose, blood pressure, weight). Measurements are carried out by patients remotely via medical devices granted for patients to use themselves. MSD Italy is also engaged in the exploration of remote monitoring solutions and prevention in the healthcare industry. Several players can benefit from this system:

- NHS could promote a more efficient use of healthcare resources (minors access to emergency care, decrease in hospital stays, etc.) and concrete support to the integrated management of the hospital and territory;

- clinicians can exploit an innovative support for the daily management of their work with better measurable clinical results over time; and

- patients could have an improvement in the management of the disease due to better adherence to their care plan and improved awareness of their health conditions.

The case also shows that digital technologies are crucial for improving the effectiveness and efficiency of a wide range of business processes in the healthcare industry. The case shows that such improvements are possible under several conditions.

First, new digital services must be supported by an adequate communication strategy addressed to the citizen. It is essential that the same players and channels participate as a promotional vehicle for the new services to inform citizens who are in a long queue waiting for a report that it is now possible to download this medical report from home via the web or on their smartphone.

Second, these projects are characterized by high levels of process innovation and technological innovation that make them critical. The literature (Hitt and Brynjolfsson, 1996; Mahmood and Mann, 1993; Devaraj and Kohli, 2002; Dameri, 2005) related to the results of such projects does not allow a real assessment of the results achieved. What follows is an opportunity to take special care in the planning phase of these projects and the evaluation of the results produced.

Furthermore, business directions need to be able to evaluate, using objective indicators, the investment components and operation of the ICT by comparing costs with the actual

results of using the business information system in relation to expected benefits, with particular regard to the contribution that the system information is able to ensure. This requires the ability to measure the impact of information systems on business processes and the value of the service perceived by customers.

These business models have value propositions that are different from those of hospitals. These healthcare players embed into their business models technologies that are able to simplify the work performed, assembling their resources, processes and profit formulae in ways that differ from more traditional business models (Hwang and Christensen, 2008). Focusing on specific portions of health care, they can offer care services at a lower cost and with higher quality.

6. Conclusions

Healthcare processes are very complex, involving clinical and administrative tasks, large amounts of data, and a large number of patients and personnel. Healthcare processes are also very dynamic (Anyanwu *et al.*, 2003), requiring the cooperation of several healthcare players. In this context, effective process support is crucial (Lenz and Reichert, 2007). The main advancement achieved through emerging concepts in empirical BPM research is the increasing interest in this field of research (Houy *et al.*, 2010) because BPM is important in healthcare organizations as well as in the industry in general.

The shift in the healthcare industry from volume-oriented organizations to value-oriented organizations has led performance management in health care to move from an outcome-based approach to a system-based approach (Buttigieg *et al.*, 2016) and has driven clinicians and managers to pay more attention to processes to obtain better health system performance. Health care organizations are more frequently employing BPM.

In all other industries, the use of BPM has become crucial to ensure higher competitiveness through improved processes that can add value (Zairi, 1997). Compared to other manufacturing industries, process management in health care is behind, even though it seems necessary for improving the quality of care. The studies on this topic are few and fragmented, and there are even fewer studies on the adoption of IT to support healthcare processes.

Therefore, this study presents an analysis proposing that healthcare organizations can and should utilize digital technologies through the development of advanced ICTs system and the employment of medical digital devices, which are in turn related to more innovative clinical process management.

Thus, this research aims at contributing to BPM in the healthcare industry and the digitalization of such processes by providing new insights on whether and how digitalization of the clinical processes system can facilitate higher performance.

In this study, BPM was analyzed in the MSD Italy case to examine the resulting outcomes of establishing digital technologies in BPM within the organization. The results show significant improvements in healthcare processes by simplifying services and processes, making them more efficient while at the same time delivering better quality and reduced response times.

6.1 Theoretical implications

From a theoretical point of view, despite the existence of a large number of studies on BPM, existing studies are largely focused on traditional manufacturing or services industries, while process management in health care is behind that in other industries, even though it seems necessary for improving the quality of care. Furthermore, the health care industry is facing challenges that make the adoption of these processes necessary (Rebuge and Ferreira, 2012).

Another crucial reason for the difficulties in clinical process management seems to derive from the lack of communication and understanding between managers and clinicians, who

often tend to concentrate on individual patient care at the expense of general health care services and the performance of health systems in which they operate (Lega *et al.*, 2013).

In such a context, our research aims at contributing to the theoretical literature by exploring opportunities provided by digital technologies for the healthcare industry. More specifically, starting from the way new business models are changing in the healthcare industry, we explore how the expanded use of digital technologies could support process management in the healthcare industry.

We believe that in the current healthcare environment, digitalization of clinical processes offers the opportunity to maximize resources and reduce waste without a reduction in the quality of patient care. In addition, we highlight that quality of care should be based on patient centeredness, accessibility, efficiency and effectiveness and that physicians and managers should identify clinical processes capable of delivering health care services in an integrated way. We also affirm that physicians and managers should cooperate and that health care organizations need to continuously improve the quality of care delivery.

More specifically, the advent of Web 2.0 technologies has revealed a greater variety of ways for people to check, record and share information and their opinions and experiences; to monitor their health states; and to produce and share their health data. The possibility of combining the consumption and production of services describes how digital technology users can create and share the content of information with many other people that are part of the healthcare environment.

The data generated from mobile apps and digital devices and shared on social media sites where medical and health issues are discussed can generate value for companies, government institutions and health enterprises.

Another issue that emerged from the study is that of telemedicine technologies. Telemedicine refers to the use of digital technologies aimed at communicating with patients, producing clinical diagnoses and offering health care services in remote locations. More broadly, it refers also to non-clinical services offered via digital technologies.

Both the use of healthcare digital platforms and telemedicine could drive several benefits. First, they could drive the rationalization of specialist resources by avoiding waste, even through the standardization of information and data necessary to the establishment of centralized databases for epidemiological and statistical studies. Moreover, they offer the opportunity to obtain uniformity of medical treatment through the application of homogeneous protocols management, as well as greater efficiency in systems analysis and validation of the treatment protocols through event tracking and monitoring. Finally, they could drive the reduction of patient transfers, limiting them to those cases requiring surgical treatment.

Despite the benefits, the use of new digital health technologies also has difficulties and critical issues that need to be addressed. The main concerns involve how both patients and healthcare professional must be trained to use such technologies and how the large quantity of data that people may collect and provide from such technologies can be used by healthcare providers (Gruman, 2013).

Another concern regards how patients and healthcare workers could resist the use of such technologies: patients' resistance to the use of digital technologies in healthcare services could be explained by factors such as indifference and incompetence, especially by older people. Finally, healthcare professionals and providers are also concerned about the boundaries between the patient and doctor and patient privacy problems in relation to the use and sharing of sensitive data on digital platforms (Thielst, 2011). The benefits and barriers are synthetized in Table I.

Several actors could benefit from the adoption of such technologies: more specifically, all public and private institutions of National Health System due to a more efficient use of health resources (minor access to emergency room, reduction of hospital stays, use of consumable goods, etc.) and concrete support for integration between hospitals and territories.

6.2 Managerial implications

Managerial implications also emerge from this case study. As innovation plays a key role in the sustainability of healthcare systems, which can be considered a "Grand Challenge" (Foray *et al.*, 2012), managers should understand whether new digital technology-based approaches in healthcare can provide the long-term economic benefits they expect.

Behringer (2015) shows that IT will play a crucial role in the hospitals of the future, supporting the management of both administrative tasks and medical data and allowing cooperation with other organizations to make access to diagnostic outcomes faster.

Digitalization in health care is being used to predict and cure diseases and enhance quality of life (Marr, 2015): for example, mobile apps are used to support healthier lifestyles.

Digitalization allows home-based health care delivery, allowing patients to stay out of hospital beds and significantly reducing costs (Intel, 2016).

This research shows also the need for a greater patient orientation toward healthcare service development, supporting the idea that patients do not need to be seen in a passive position but rather that they are the targets of care and are able to give feedback and change service providers.

In conclusion, healthcare digitalization needs an environment that can ensure the sharing of information. Healthcare organizations enabling a solid IT and business strategy partnership obtain benefits such as improved collaboration and problem solving, deliver higher service levels and improve clinical process efficiency.

6.3 Limitations and future research

Of course, the study suffers from some limitations, and there is room for further investigation. The analysis highlighted the necessity of investigating this field of research more thoroughly. A single case study, in particular, suffers from limitations related to methodological rigor, researcher subjectivity and external validity, making it difficult to propose MSD Italy as a replicable model. To obtain greater reliability and replicability, the analysis should examine other case studies to understand the potential replicability of the findings.

Second, this analysis is not able to provide a construct for measuring the improvement of business processes, as an exclusively economic evaluation is not always favorable and appears to not be an appropriate measuring method since it does not take into consideration certain strategic factors, such as the increase in efficiency and corporate performance, the increase in the quality of processes and business services, and the value increase for end users.

Therefore, future research should analyze the impact of information systems on business processes and the value of the service as perceived by customers. In this context, it is important to evaluate the economic costs and/or benefits of a product/project/service and the overall assessment, both quantitative and qualitative, of the impact on the healthcare company's information system through the suitable measurement of the value of the use of ICT in health through a multidimensional evaluation of projects, both for decision making, through information that will facilitate the sharing and the authorization of the project, and for the evaluation of results.

Benefits of digital technologies in healthcare	Barriers to digital technologies in healthcare
Increased safety or reduced medical errors	Appropriate training of clinicians and patients
Cost saving, thanks to the disease remote management	
Real-time data access thanks to mobile devices and mobile apps	Big Data management
Time saving, reducing the number of improved clinical processes	Patients' resistance to use of technologies for indifference/incompetence
	Legal and privacy issues

Table I.
Benefits and barriers of digital technologies in healthcare

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Further reading

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Corresponding author
Elena Laurenza can be contacted at: elena.laurenza@uniparthenope.it