Received 2 December 2020
Revised 14 June 2021
19 October 2021
22 December 2021
12 January 2022
Accepted 18 January 2022

CAOS in Italian hospitals during COVID: an analysis of healthcare intangible resources

Mauro Paoloni and Giorgia Mattei
Department of Business Studies, Roma Tre University, Roma, Italy
Niccolò Paoloni
Department of Law, Roma Tre University, Roma, Italy, and
Giuseppe Modaffari
Department of Law and Economics of Production Activities, Sapienza University of Rome, Rome, Italy

Abstract

Purpose – This paper aims to analyse the roles of relational capital (RC) and knowledge management (KM) during the COVID-19 in Italian public and private hospitals, considering that intangible elements are essential during periods of uncertainty.

Design/methodology/approach – Authors used a qualitative design in a case study on two Italian hospitals that have different ownership structures, which are located in the epicentre of the pandemic in Lombardy. The study was carried out using the CAOS ("caratteristiche personali", "ambiente", "organizzazione" and "start-up") model (Paoloni, 2021), which allows for comprehending and commenting on RC because of the connections between typical factors that influence an organisation. The model also allows for discussion of the use of a network and how it supports organisations.

Findings – Findings of the analysis showed that during the management of the COVID-19 health emergency, ownership structure was not a discriminating factor, the created relationships were similar and they were considered in the same way. The relationships were mainly formal (except for contributions by associations or individuals) and temporary. The RC's reactive role in overcoming crises was confirmed, and the findings indicated that this result was possible also, thanks to the KM's role played within the organisation.

Originality/value – Theoretical implications of the work are that it contributes to the sparse healthcare literature on intellectual capital (IC) and on RC and its relationships with KM. The practical implications are related to the creation of new relationships during the healthcare emergency between hospitals and the central government, which can be considered a useful lesson for the future. The theoretical implications derived from the analysis are generalisable to all organisations regardless of their type and location, as well as the practical implications are applicable to the entire national territory.

Keywords Intellectual capital, Pandemic, Crisis, Public ownership, Private ownership

Paper type Research paper

1. Introduction

In Italy, the national healthcare service offers universal access to locally based healthcare, where local authorities are responsible for the organisation and delivery of health services. This leaves the Italian government with a weak strategic leadership in this sector (Armocida

The analysis of the cases was done using the publicly available online information of the considered hospitals. The authors would like to thank the reviewers for their comments and suggestions during the review process because they enabled to refine the research.

Journal of Intellectual Capital
Vol. 23 No. 7, 2022
pp. 18-37
Emerald Publishing Limited
1469-1930
DOI 10.1108/JIC-12-2020-0365

et al., 2020). In this Country, hospitals are public, private, for-profit and private non-profit. All hospitals usually compete with others for the provision of services, directly or indirectly. However, all are considered relevant players (Hansmann, 1980).

As in other countries, the healthcare sector continues to be at the centre of significant changes and challenges (Pereira de Souza *et al.*, 2021), especially from the 2020, where healthcare sector was tested by the Covid-19 pandemic, which has created a global public health emergency to which governments have been called to respond. During this emergency, the lack of coordination is a problem (McDonald and Larson, 2020) nonetheless, the local governments (LG) were left to respond independently. In Italy, the coronavirus outbreak in the north, especially in Lombardy, which was identified as the epicentre of the pandemic, has overwhelmed the public health system.

Regarding the need to cope with this type of event, scholars claim that the intangible elements in organisations have strategic importance (Jia *et al.*, 2019; Prasad *et al.*, 2015). In this panorama, the IC elements, such as *human capital* (HC), *structural capital* (SC) and *relational capital* (RC) (MERITUM, 2002), become very important. These components are essential for enhancing knowledge in organisations and allow them to become resilient (Johnson *et al.*, 2013). Previous studies assert that there is a close correlation between IC elements and Knowledge Management (KM) (Kianto *et al.*, 2014), which are both capable of improving organisational efficiency through relational skills and external networking (Kianto *et al.*, 2014; Buenechea-Elberdin *et al.*, 2018). Although the topic of IC has received a lot of attention in the literature during the last 20 years, few previous studies have focussed on the connection between IC components and KM (Buenechea-Elberdin *et al.*, 2018). This gap in research may have been because of the novelty of the topic, which has been foregrounded in the context of the current pandemic. Therefore, this work aims to address the following research question:

RQ1. What roles have RC and (KM) played in hospitals during the pandemic?

A multiple case study was used to answer the research question, where two hospitals located in Milan (Lombardy, Italy), one private hospital and one public, were analysed. This study was done used the CAOS (an Italian acronym *caratteristiche personali*, *ambiente*, *organizzazione* and start-up) model (Paoloni, 2021); a qualitative approach developed within the strategic management studies (Mason, 1939; Bain, 1968), that is useful to explore the type and intensity of relationships (RC).

The findings reveal several implications. Firstly, the work contributes to the literature on intangible assets by revealing that RC and KM are critical for health sector resilience during a pandemic. RC is a considerable factor in reactive resilience, and KM thanks to its capacity to manage the internal resource in an efficient manner, plays an important role in surviving harsh periods. There are also some practical implications that are connected with the created relationship between hospitals and the central government during the pandemic. In fact, as the effects could be extended to the entire national territory, it is possible to assert that the national management of the healthcare sector is preferable and the results generalisable. Hospitals of different sizes and locations, even in peripheral areas, could benefit from this relationship.

This paper is structured as follows. In section 2, the most interesting previous studies are reviewed. This part also helped the authors to lay the foundation for the study. Section 3 describes the methodological protocol as well as the case selection process and the CAOS interpretative model variables. In section 4, the results of the analysis of the relationships are discussed. The final sections of the paper conclude the work, disclosing the limitations of the study, recommending further research and highlighting theoretical and practical implications.

2. Literature background

Former research studies confirm that IC is being increasingly investigated (Lerro *et al.*, 2014), and the attention to KM has grown (Mariano and Walter, 2015). Although these two topics seem different, they could be considered intertwined and parallel (Hussinki *et al.*, 2017). For example, KM "is crucial for exploiting business relationships and extracting value from the external networks of the organisation" (Del Giudice and Maggioni, 2014). Also, some studies have argued that IC and KM are closely related. IC explores intangible elements from a static perspective (Cabrilo and Dahms, 2018; Stewart, 1997) and studies on KM are focussed on managerial activities conducted to deal with organisational intangibles (Kianto *et al.*, 2014).

In the healthcare literature, IC has not been frequently chosen as a topic of investigation (Orlando *et al.*, 2021) remaining for long as an "unknown terrain" (Habersam and Piber, 2003). However, intangibles such as IC, are considered "critical" (Cabrilo and Dahms, 2018) as they allow organisations to achieve a competitive advantage (Davenport and Prusak, 1998; Heisig *et al.*, 2016) and for this reason, the analysis should be deepened.

Previous studies on IC components (HC, SC and RC) show that some of them have been considered more important than others. In any case, precisely because the healthcare sector is characterised as having a high intensity of knowledge, it is considered a fertile ground for studies on different component of IC. Furthermore, this statement is also true for RC because in this specific sector, the value chain is formed by several actors and competencies (Huang *et al.*, 2021). RC is significant because according to a definition (Euroforum, 1998), it encompasses the image, the reputation and the satisfaction of users (Daou *et al.*, 2019), including all relationships that the entity can create with its stakeholders. Relationships such as established links between the company, institutions and people, based on a strong sense of belonging and the capacity for cooperation (Capello and Faggian, 2005). In addition, some scholars have highlighted that RC plays a central, strategic and influential role in long-term activities and returns (de Castro *et al.*, 2004), as it provides access to critical internal and external resources (Hitt *et al.*, 2001; Nahapiet and Ghoshal, 1998) and reflects the value of relationships, as well as the existing quality of people and organisations (Yang and Lin, 2009; Fiano *et al.*, 2022). Although RC is considered the most valuable intangible asset (Stewart, 1997), it has received little attention in the literature (Paoloni *et al.*, 2020a).

Therefore, several relevant issues have remained unaddressed in this sector. For instance, challenges of improving the quality of relationships between patients and healthcare employees with providing adequate health services and enriching positive perceptions of users of the value chain, which is composed of different actors and their specific skills (Thakur *et al.*, 2012). Moreover, RC could impact the general reputation of organisations (Habersam and Piber, 2003), especially where there are strong cognitive involvement (Fiano *et al.*, 2022) as healthcare, sector in which Information and Communication Technologies and R&D investments are essential (Papa *et al.*, 2020).

By focussing on KM in the healthcare sector, it is possible to assert that creating and sharing knowledge is a complicated issue. This sector's complex, multi-professional and multi-level nature is reflected in the fragmented distribution of healthcare knowledge (Nicolini *et al.*, 2008). Following the recent literature, KM as a topic in the healthcare sector can be observed on three main streams (Berg, 2004): (1) information about patients; (2) management information about the processes and outcomes of the organisation; and (3) professional knowledge required to handle the patients optimally. The third stream is related to the relational networks created among people based on the adoption of a collaborative, relational approach (Saviano *et al.*, 2017) and the use of infrastructure (Murray *et al.*, 2016; Švarc *et al.*, 2021). That leads to the enablement of the organisations to generate and coordinate knowledge in an efficient manner (Serino *et al.*, 2020). These relationships are the primary tools for transferring tacit knowledge (Hansen *et al.*, 1999) and making strategic decisions aimed at facilitating the creation, sharing and transfer of knowledge (Zack, 1999).

They are also considered extremely important in addressing knowledge-based issues in organisations (Grant, 1996).

Finally, a few previous studies have examined the interaction between IC and KM (Wiig, 1997; Buenechea-Elberdin *et al.*, 2018; Cabrilo and Dahms, 2018; Kianto *et al.*, 2014; Seleim and Khalil, 2011; Pflugfelder, 2021). Inter-organisational knowledge flows play an important role in modern healthcare systems (Laihonen, 2012) and SC and RC reflect the outcomes of codification and personalisation of KM strategies (Buenechea-Elberdin *et al.*, 2018). Moreover, the importance of the relationships between dynamism of KM, and the static perspective of IC (Kianto, 2007; Kianto *et al.*, 2014) is established. Especially when the focus is on the capabilities of KM practices to leverage intangible assets for value creation Kianto *et al.* (2014). Therefore, it appears that a personalisation-based KM strategy enhances RC. Moreover, as the embeddedness of relationships is positively associated with the effectiveness of knowledge transfer (Ferraris *et al.*, 2020), RC could be considered as the result of this approach (Buenechea-Elberdin *et al.*, 2018).

However, what happens when the circumstances are unusual, as in crises or challenging times?

Although this topic has received scant attention (Prasad *et al.*, 2015), several studies have showed that some IC elements (i.e. SC and RC) are fundamental to survival in the time of crisis and increasing the resilience of organisations. Based on the findings of former analyses, it is possible to assert that these elements of IC allow organisations to access valuable information and resources and achieve organisational resilience (Johnson *et al.*, 2013). This is thanks to the ability of organisations to develop a preventive capacity during unexpected disruptions (i.e. the proactive aspect) and to take necessary actions regarding responding to and recovering from such disruptions (i.e. the reactive aspect) (Jia *et al.*, 2020). Hence, the key attributes such as an organisation's flexibility (Kuminova and Bykova, 2014) and the existence of an open and collaborative ecosystem created by KM practices (Santoro *et al.*, 2018), allow organisations to quickly formulate responses to a disruptive event, recognising that positive behaviours (e.g. trust, commitment and reciprocity) are derived from organisational culture as well as the norms and practices that were in place before the crisis.

3. Methodology

This work is supported by a qualitative multiple case study. This method is appropriate for examining contemporary issues in particular settings (Benbasat *et al.*, 1987; Yin, 2009). The case selection was performed via purposive sampling of hospitals that have differing ownership but are located in the same Italian region. The selected hospitals are both similar and different and this allows us to illustrate the paper's theoretical interests (Eisenhardt and Graebner, 2007).

To answer the research question, we used the CAOS model (Paoloni, 2021) which aims to interpretate RC thorugh the connections between factors that typically influence the relationships. This approach resulted from the evolution of industrial organisation studies, which were subsequently transformed into strategic management studies and on which the Harvard Business School is based (Mason, 1939; Bain, 1968). In this approach, the sector, the company's structure and its performance are correlated to the resource-based view (Penrose, 1959; Peteraf, 1993; Wernerfelt, 1984), which acknowledges that performance is no longer dependent on the corporate structure but on the company's possession of specific resources and capabilities. In the most recent approach, which is known as the knowledge-based approach (Nonaka and Takeuchi, 1995), the possession of unique and rare knowledge is the primary resource for creating the value of a business. The development of this approach led to the relational view (Dyer and Singh, 1998), which extends the boundaries of investigation into the possession and dissemination of knowledge and the study of the relationships that the

company promotes. This view fits the CAOS model (Paoloni, 2021), which is employed to study the types and intensities of the relationships intertwined in a specific observational moment.

The determinants of the model include the following:

(1) *(C) refers to the personal characteristics of an entrepreneur,* and it describes the specific characteristics of the hospital.

(2) *(A) refers to the macroeconomic element of the analysis*, and it is related to the environment in which the healthcare organisation operates.

(3) *(O) refers to the microeconomic element of the analysis*, particularly focussing on the *Organisational and managerial aspects.*

(4) *(S) refers to the temporal element.*

The CAOS model allowed us to analyse the relationships between the hospitals based on four types of network relationships (Paoloni, 2021), which are crucial for understanding how the network supports the entities (Cillo *et al.*, 2019; Scuotto *et al.*, 2017) through challenges of the pandemic. The relationships were characterised by the intensity of the relational variable (permanent or temporary) and its type (formal or informal). From the intersection of these variables, we sought to determine the following:

(1) *Formal and permanent relationships*: long-term relationships that are formal;

(2) *Formal and temporary relationships*: those relations which were temporary but formal;

(3) *Informal and permanent relationships*: lasting informal relationships;

(4) *Informal and temporary relationships*: informal short-term (or limited-term) ties.

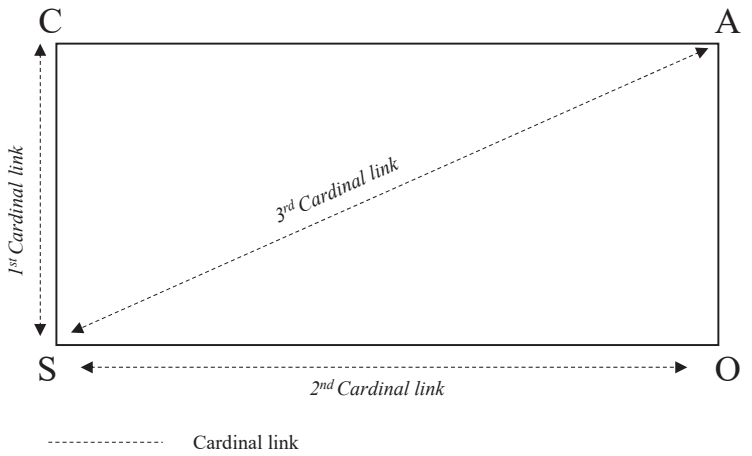
To apply the CAOS model and to identify the kinds of relationships, it is necessary to analyse the elements and identify the connections between the driver S and the drivers C, O and A in the cardinal links. The model identified four network relations, as shown in Figure 1.

The cardinal links is first (S–C/C–S), second (S–O/O–S) and third (S–A/A–S).

The first cardinal links are identified as all the contacts that the hospital activated to face the emergency; they depend on their characteristics, needs and motivations. *The second cardinal links* are those relationships that the governance of the hospitals activated during the observational moment of reorganising their internal structure and redefining the roles, tasks and responsibilities associated with them, as well as the relationships among the various governing bodies (i.e. lines of influence). Hence, during the emergency period, the hospitals were called to redefine their internal relationships to deal with COVID-19-related challenges. *The third cardinal links* during the emergency phase are the hospitals and their environment. Therefore, they are considered as external relationships of the HO. In these relationships, the environment is the driver of the relational circuit. It can be said that using a certain type of network is not a conclusive solution to an issue, but it is necessary to do in particular situations, such as an emergency.

3.1 Case study selection process

The selected hospitals for the case study are the Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS) San Raffaele and the Azienda Socio–Sanitaria Territoriale (ASST) Grande Ospedale Metropolitano Niguarda, both of which are in Milan, Lombardy. These hospitals are chosen for three reasons: firstly, because the Italian health system is locally based and the study of two hospitals in the same area makes it possible to compare the findings as both



Source(s): Paoloni, 2021 revised

Figure 1.
Connection and interdependence in the C.A.O.S. model

structures are subject to the same legislation. Hence, since public health expenditure is mainly financed by the regions, the selection of two hospitals located in the same geographical area prevents differences in planning, which are not the result of the entity itself but are defined at the territorial level. Secondly, one of these hospitals is private and the other one public. This decision was made to address differences that could be attributable to the ownership structure. The third reason is that Lombardy was the epicentre of the coronavirus outbreak. Therefore, it has had significant difficulties in terms of emergency management.

The information on both hospitals was collected from secondary documents (Corbetta, 2003) that are publicly available online. The main research channels were the official websites of the hospitals, where the financial statements, performance reports and other informative and qualitative documents addressed to stakeholders were identified. Further information was drawn from newspaper articles, press releases, information on regional websites and the Italian Ministry of Health and Italian Civil Protection.

The following sections describe the case study of the two hospitals based on the CAOS model.

3.2 Specific characteristics of the hospitals (C)

3.2.1 Niguarda hospital. The first hospital examined in the case study is ASST Grande Ospedale Metropolitano Niguarda, a large public hospital. This hospital was founded in 1939 to provide Milan with a generalist referral hospital. Over the years, the hospital has become autonomous, nationally important, highly specialised and recognised as a hospital unit. Entity policies aimed at achieving these goals are determined by the hospital's administration, including the general manager, the board of directors, the auditors' committee and the assessment body.

3.2.2 San Raffaele hospital. The second hospital is IRCCS San Raffaele. Its legal form is a limited liability company, but as a private company, it is accredited by the National Health Service (NHS). Therefore, admissions, visits and examinations can be conducted for a fee and through the Italian NHS. This hospital was founded in 1971 to provide specialised care and develop new therapies for many pathologies. This function is known as an IRCC, which means that it is characterised by the tasks it must perform. The corporate governance of the

San Raffaele Hospital is made up of the shareholders, the administrative body, the board of statutory auditors and the auditors' committee.

3.3 The environment in which the healthcare organisations operate (A)

In 1978, Italy's tax-funded NHS was established with the aim to guarantee uniform levels of care throughout Italy, equitable access to services for all Italian citizens and legal residents in Italy, as well as to control health expenditures. In the 1990s, reforms aimed at controlling public expenses were made. The Italian NHS was reshaped, becoming more efficient. After fiscal federalism was introduced in the 2000s, the responsibility for expenditure control was strongly decentralised. Planning was conducted at the national healthcare level, however, the regions became autonomous in terms of legislative and regulatory power, although, their boundaries were imposed by the central government (Armocida *et al.*, 2020). The Italian hospitals are represented by various organisations: public, private for-profit and private non-profit and all of them directly or indirectly compete with one another for the provision of services. Nevertheless, all are considered relevant players in the health sector, because the public organisations are not always sufficient (Weisbrod, 1988) and there are strong "information asymmetries" (Hansmann, 1980). In this context, non-profit organisations are important because they are considered a mix of public and private entities (Arrow, 1963). Public hospitals survive because of public funding, while mixed funds are used to finance private ones. That is, the funds that are provided in part by the public system and in part by private citizens. Volunteers play a fundamental role in this since they conduct more than 59% of their activities in social welfare and health services (Ripamonti *et al.*, 2017). Since 2008, the Italian central government has increased its efforts to reduce healthcare costs. Regarding the "efficiency" of the Italian healthcare sector, during the last years, healthcare expenditures have been cut several times, and the number of hospital beds has been reduced to 3.7 per 1,000 inhabitants, which is a decrease from the previous 4.0. In Lombardy, which was the "red zone" of the COVID-19 in 2020, the number is 2.97 and it is 3.34 in southern Italy. Concerning the availability of beds in intensive care units, Italy possesses 5,179 places, 724 of which are in Lombardy, in addition to 176 single-specialist beds for a total of 827 beds, of which 593 are in public facilities and 232 are in private facilities. Initially, not all beds were intended for COVID-19 patients because they were occupied by patients with other diseases. The above numbers, albeit high, proved to be insufficient in the face of the needs of patients affected by the virus who had to be transferred to intensive care. Thus, in Lombardy, in a short time, collaborations were formed between public and private hospitals, and external financiers provided support, which increased this number to 1,500 by 24 March (+110%), and there were 9,284 treatment beds throughout Italy (+79%) (Ministero della Salute, 2020).

A further difficulty encountered in emergency management was procuring the machinery and equipment necessary to treat patients. However, because of the government's diligent work, it was possible to establish relationships with suppliers to procure personal protective equipment (PPE) in collaboration with civil protection.

3.4 Organisational and managerial aspects (O)

3.4.1 Niguarda hospital. The administration of this hospital is composed of the general director, the administrative director, the health director and the social health director.

The organisational structure of Niguarda, which is under the control of the general director, is as follows:

(1) The Hospital Centre is divided into hospital facilities and/or departments organised on different levels of intensity of care.

(2) The territorial network is divided into territorial hospital facilities (POT) and socio-sanitary facilities (PreSST).

Together, these two organisations set the mission of Niguarda: to integrate specialised care with territorial health social activities in synergy with all the actors involved in citizens' health protection.

The core features of Niguarda are the following: (1) It is a general hospital that covers all patient care and manages all diseases using holistic treatments based on a multidisciplinary approach; (2) It specialises in the treatment of acute and complex pathologies and treats patients with acute needs, in a multidisciplinary perspective with the support of various high-tech tools; (3) It offers a health network for the continuity of care. The hospital has established networks with local outpatient units and cooperation with external care centres to help patients in the post-hospitalisation period according to the model of social-assistance continuity of care; (4) It is a teaching and research hospital. At the end of 2019, Niguarda Hospital had 4,550 employees: 887 medical officers, 1,735 nursing staff and 1,967 health technical staff.

3.4.2 San Raffaele hospital. The shareholders meet to deliberate matters decreed by law. The administrative body, which consists of a board of directors with seven members, has ordinary and extraordinary management powers, excluding only those reserved by law or by the Articles of Association exclusively for the shareholders. The board of statutory auditors supervises corporate management. The auditors' committee, represented by an auditing firm, controls financial accounting.

The hospital's strengths include state-of-the-art treatments that rely on the hospital's structure and research, as well as the clinical and university education of its staff, all of which interact continuously. At San Raffaele Hospital, training is assigned to individual employees or collaborators based on specific professional needs. Training is also offered to future providers or students at the University of Milan's medical and nursing faculties. This hospital also trains doctors in patient relationships through student participation in assistance and research. San Raffaele Hospital, as previously mentioned, is a scientific hospitalisation and care institute (IRCCS), and its research function consists of immunology; transplantation and infectious diseases; neuroscience; experimental oncology and genetic and cell biology. Its research and treatments are customised according to the needs of patients.

3.5 Moment of observation (S)

The coronavirus outbreak in northern Italy, especially in the Lombardy region, the epicentre of the coronavirus emergency, has overwhelmed the public health system. In early January 2020, the rapid onset of the disease became evident. In a matter of weeks, the outbreak of the severe acute respiratory syndrome known as the coronavirus, was recognised as a pandemic that was affecting over 100 countries. In Italy the resilience of the Italian national health system was challenged (Remuzzi and Remuzzi, 2020). On 20th of February 2020, a patient in his 30s was admitted to the intensive care unit (ICU) at Codogno Hospital (Lodi, Lombardy, Italy) and tested positive for COVID-19. The positive result was immediately reported to the Lombardy healthcare system and governmental offices. The next day, February 21st, an emergency task force was formed by the Government of Lombardy and local health authorities to respond to the outbreak (Grasselli *et al.*, 2020). On 30 January 2020, the World Health Organisation (WHO) declared the coronavirus outbreak a public health emergency of international concern. Since then, the Italian government has implemented extraordinary measures to restrict the spread of the virus. In addition, local medical authorities adopted specific WHO recommendations to identify and isolate suspected cases of COVID-19. Suspected cases were transferred to preselected hospital facilities where the SARS-CoV-2 test was available, and infectious disease units were ready to isolate confirmed cases.

Following the first confirmed case of COVID-19, the emergency medical system (EMS) of the metropolitan area of Milan instituted a COVID-19 response team of dedicated and highly qualified personnel, with the goal of tackling the viral outbreak without burdening ordinary EMS activity. The COVID-19 team collaborated with regional medical authorities to design a procedural algorithm for detecting suspected cases of the coronavirus (Spina *et al.*, 2020). Hospitals in Lombardy became rapidly overcrowded by COVID-19 patients, especially intensive care units. Non-specialised doctors in infectious or respiratory diseases, including neurosurgeons, were reassigned to the new Covid wards to rationalise the use of resources. Hence, the regional health system was rapidly reprogrammed (decree *n*° XI/2906) to contain the spread of COVID-19 (Grasselli *et al.*, 2020; Spina *et al.*, 2020). On 8 March 2020, the Lombardy Regional Council organised an emergency task force to respond to the outbreak (Zoia *et al.*, 2020). The national government and the regional authorities announced a series of countermeasures to slow down the rapid increase in the number of newly infected patients and intensive care cases. Local health authorities implemented several measures to expand their capability to save lives. However, when the coronavirus suddenly became a pandemic in northern Italy, the Italian NHS was unprepared (Santacroce *et al.*, 2020). One reason could be related to the decentralisation of the NHS. The low integration of primary care in Italy might also have limited the capability of the Italian NHS to deal with the new risk (Kaixuan, 2020). At the regional level, the governments and local health authorities in charge of the NHS at the executive level, adopted measures to increase the number of the beds for COVID-19 patients. Hence, the number of public and private ICU beds increased from 640 in Lombardy in the initial phase and to more than 900 on 20 March 2020 (Kaixuan, 2020).

The countermeasures adopted at the territorial level were confirmed shortly afterwards, as were the provisions issued at the central level. Even though the Italian national health system considers that both public hospitals and accredited private hospitals are actors, which normally cover scheduled surgical disciplines and therefore may appear to be marginal subjects in responding to the current epidemic, it became necessary to involve them in the management of the emergency. Thus, on February 24, the General Welfare Directorate of the Lombardy region asked the 103 facilities in Lombardy, more than a quarter of which are private, to be equipped with first aid, to suspend elective surgical activities and to receive coronavirus patients. This measure was not appreciated by patients on the operating list and required considerable organisational efforts in many private facilities. Nevertheless, it was obligatory because 31% of the almost 900 beds in intensive care in Lombardy were in accredited facilities (Ricci and Tarricone, 2020) (see Figure 2).

4. Discussion: analysis of relationships

According to Paoloni (2021), relationships may exhibit different levels of solidity and this due to their persistence in time and to the level of trust between the involved individuals and their active and constant participation in the life of the organisation. During the COVID-19 pandemic, most of the relationships in the Lombardy hospitals were formal. This finding could be justified considering the importance of the health system in Italy and the strong impact that the pandemic had on the hospitals. The main results of the CAOS model are as follows.

The first analysed link was the cardinal link S-C. Through this analysis it was possible to identify the contacts activated in the hospitals during the emergency. The findings showed that formal and temporary or permanent relationships characterise this connection. Considering that the two selected hospitals for the present study differ in terms of ownership, this link was managed differently at different times. Here, it is important to remember that the Lombardy health system was initially reorganised and then supported and endorsed at the national level.

Determinant of the C.A.O.S. Model	Niguarda hospital	San Raffaele hospital	Main issues
C	ASST Grande Ospedale Metropolitano Niguarda is a public hospital of reference for Italy. It was established in 1939 as a generalist hospital in Milan. In 2016, it became *ASST (Azienda Socio-Sanitaria Territoriale)*, redefining its aim to focus on efficiency, effectiveness, cost-effectiveness and transparency. The general manager, the board of directors, the auditors' committee and the assessment body, characterized the governance.	"I.R.C.C.S. San Raffaele" is a university polyclinic that has international relevance and high specialization. LLC is the legal form chosen for the establishment in 1971; however, it is also a private company accredited by the National Health Service. The corporate governance is made up of a Shareholders' Meeting, the Administrative Body, the Board of Statutory Auditors and the Auditors Committee.	- Niguarda is public while San Raffaele is private; - Both hospitals are accredited to the national health service; - There are some differences in the composition of Corporate Governance bodies.
A	In 1978, the National Health Service (NHS; Servizio Sanitario Nazionale, SSN) was established in Italy. The NHS aims to guarantee uniform levels of care throughout Italy, equitable access to services for all Italian citizens and legal residents in Italy. In the 1990s, to contain the public expenses, the Italian NHS was reshaped and became more efficient. Especially after the fiscal federalism introduced in the 2000s, the responsibility of expenditure control has also been strongly decentralized. Since 2008, the Italian central government had increased its efforts to reduce health care costs. In the name of "efficiency", during the last years, healthcare expenditure was on several items. In this way, with the advent of COVID-19, a further great difficulty has been encountered due to the difficulty in procuring the machinery and equipment necessary to treat patients. Thanks to intense work carried out by the government, in collaboration with the Civil Protection, it was possible to establish relationships with suppliers for the procurement of DPI and equipment.		- Both Hospital are located and, therefore, are involved in the same environment
O	Besides corporate governance bodies described in variable (C), Niguarda Hospital's organization composes of two sectors: - Hospital Center, in turn, divided into several departments - Territorial Network, in turn, divided into POT and PreSST Referring to the Niguarda Hospital employees, at the end of 2019, it equalled 4,550 employees divided into: 887 medical officers, 1,735 nursing staff; 1,967 health technical staff.	Besides corporate governance bodies described in variable (C), San Raffaele Hospital's organization composes of three sub-structure: - Research; - Clinic; - University education. San Raffaele, as already mentioned, is a "Scientific Hospitalization and Care Institute" (IRCCS), and its research branches into four departments: Immunology, Transplantation and Infectious Diseases; Neuroscience; Experimental Oncology; Genetic and Cell Biology. San Raffaele places the patient at the centre of its care; its research and treatments are customized according to their needs.	- San Raffaele has a lighter organization than Niguarda, predominantly thanks to its private nature.
S	The coronavirus outbreak in northern Italy, especially in the Lombardy region, has overwhelmed the public health system because it functioned as the epicentre of the coronavirus. In the first days of January 2020, rapid onset of the disease became evident. It appeared less severe than SARS-CoV and MERS-CoV but more contagious. On Jan 30, 2020, WHO declared the Coronavirus outbreak a public health emergency of international concern; consequently, the Italian Government has implemented extraordinary measures to restrict viral spread ever since. Since the confirmation of the first case of COVID-19, the Lombardy hospitals were rapidly overcrowded by COVID-19 patients, especially intensive care units, and non-specialized doctors in infectious or respiratory diseases, including neurosurgeons, were reassigned to the new COVID-19 wards to rationalize the use of resources.		- Both hospitals are observed simultaneously: COVID-19 emergency.

Figure 2.
Summary of the case study descriptions

At first, the crisis was managed at the local level through the creation of task forces established specifically to deal with the crisis. Shortly after that, because of the considerable increase in the number of confirmed COVID-19 cases, the government took extraordinary measures. In the initial phase of the emergency, only public hospitals were involved; shortly afterwards, private hospitals were also asked to manage the unexpected and disastrous situation. Therefore, with the establishment of regional task forces temporary relationships were created, whereas permanent relations existed between the region and the central government. In both cases, the connections were formal because those contacts referred to relationships with institutions that were managed and maintained according to laws or regulations.

The second observed link was S-O. Here, it was possible to observe different types of formal temporary connections:

- The identified relationships were internal because the hospitals were mandated to rethink and review their organisation. Both structures had to increase the number of beds in intensive care. Therefore, the private organisations were asked to modify their usual activities (i.e. mainly planned surgical services) to support public hospitals in the management of the emergency and to accommodate patients affected by the coronavirus. They were also asked to employ private hospital staff to manage the current crisis; therefore, this event also triggered an internal organisational change in human resources. That is, it inevitably led to a review of the activities and organisational relationships within the hospitals themselves. This led to an increase in overtime compared with normal working hours.

  These actions were linked to the modification and transformation of the organisation and were aimed at promptly addressing the problems that emerged from the pandemic. The problems confirmed that flexibility and collaboration (Santoro *et al.*, 2018) have strategic importance for enabling the proactive and reactive aspects of organisations in times of crisis (Jia *et al.*, 2020);

- Hospital research areas were modified. Research topics were set aside to give more attention to the new virus, identifying its cause, as well as suitable treatments to counter the devastating effects of the virus and to obtain more information about it so that solutions could be found to stop the pandemic. This maximised the use of knowledge and effective management, which are considered critical elements in achieving a competitive advantage for organisations (Keong Choong, 2008).

These relationships were considered formal because they were established by formal documents or formalised instructions. They were considered temporary because it was assumed that when the emergency period was over, the hospitals would gradually resume their traditional activities.

The third analysed link was S-A, which represents the organisations' involvement in the territorial, social, cultural and economic environments in which they are located. In the analysed cases, this connection was characterised by both formal and informal temporary links. As explained in the theoretical part of the present work, the Italian NHS is administered in the regions. In the specific moment observed in this work, namely the pandemic, the relationship between hospitals and the political level changed. At first, the management of the emergency was left to the regions. When the situation worsened, the central government took the reins because the crisis could not be managed by the regions alone. However, the pandemic was so severe that the government had to intervene to try to deal with the emergency to prevent the health system from collapsing. Moreover, the national intervention was simultaneously caused by the varied severity of the emergency

between one region and another. In fact, there was an unequal number of coronavirus cases in the whole territory.

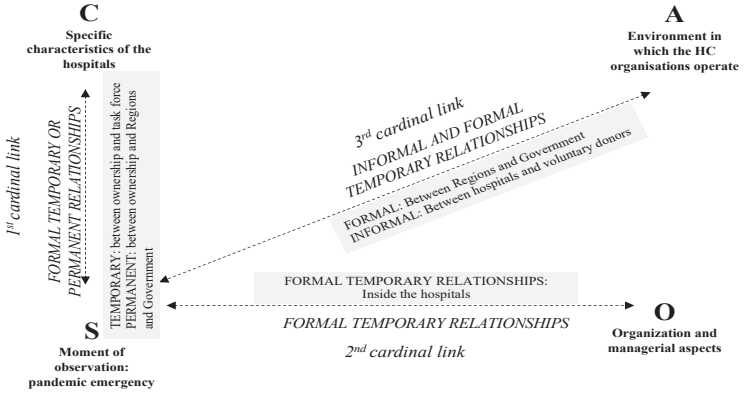
In this case, where the external relationships coming from RC promoted the internal knowledge efficiently, the existing correlation between RC and KM was evident. The relationships were identified as formal because they always intervened between the authorities and the hospitals. However, they were temporary because they were to be in place only for the time required to manage the emergency. Alternatively, it was also possible to observe one type of informal temporary relationship formed in connections with private donors or associations that wanted to support the Italian health system in this dark period by voluntary contributions.

As shown in Figure 3, the hospital's relationships during the pandemic are resumed.

The severe crisis caused by the virus could only be managed at both national and regional levels by issuing decrees and measures to reduce the risks of the epidemic. Moreover, Innovative connections with respect to ordinary operations were found in both S-C and S-A relationships. In the first connection, a formal and temporary relationship was triggered between task forces established to manage the emergency. As far as the S-A relationship is concerned, this relationship continued to be formal and permanent because it was first setup between hospitals and LG and then between hospitals and the central government responsible for health management. The link continued to be following the reforms of the national health system. Simultaneously, it was a temporary relationship because during the study period, both the debate management and timing changed. Therefore, the findings of the analysis showed that in terms of time, it was possible to identify both temporary and permanent relationships. The relationships with stakeholders were formal, except for fundraising by a wide variety of voluntary associations and private individuals who wanted to make financial contributions to the health service.

5. Conclusions

Intangible assets are a main resource for gaining a competitive advantage (Ferreira *et al.*, 2016) and allowing organisations to be resilient. RC, as a component of intellectual capital (IC), arises from relationships created between organisations and their stakeholders, creating value and improving users' satisfaction through the provided services (Ting *et al.*, 2020). This intangible resource is particularly important in the healthcare industry, in which patients guarantee the success and survival of the entity. According to the literature, RC displays



Source(s): Authors' elaboration

Figure 3.
Hospital relationships during the pandemic emergency

these potential benefits, especially during disasters and uncertain periods, such as the Covid-19 in 2020 (Jia *et al.*, 2020; Prasad *et al.*, 2015). In this context, it is also important to consider the role of knowledge, which is absolutely strategic. The use of knowledge is considered necessary to create value (Pigola *et al.*, 2021). Furthermore, the relationships between IC and KM are fundamental for the effectiveness of an organisation (Curado, 2008) and both are identified as sources of sustainable competitive advantages (Seleim and Khalil, 2011). The reason is that in the simultaneous analysis of these elements, it is possible to combine static and dynamic perspectives of knowledge (Pigola *et al.*, 2021). However, only a few scholars have examined interactions between these two constructs (Kianto *et al.*, 2014; Mariano and Walter, 2015; Cabrilo and Dahms, 2018).

To fill this research gap, in the present study, we aim to analyse RC and understand the types of relationships that were created in Italian public and private hospitals during the emergency caused by the coronavirus pandemic. One of the main goals of the present research is to understand whether the dynamism of these connections (KM) could be considered strategic in health emergency management. Therefore, the work aimed to answer the following research question:

RQ1. What roles have RC and KM played in hospitals during the pandemic?

To address the RQ, the authors chose to analyse two Italian hospitals with different ownership structures (one public and one private), which are located in the epicentre of the pandemic in Lombardy. The CAOS model (Paoloni, 2021) was applied to this qualitative case study.

The findings showed that during the management of the health emergency, similar relationships were created in both hospitals. Notably, the findings indicated that the ownership structure was not a discriminating element during the health crisis. Instead, it was possible to limit and contain the damage caused by the pandemic. The political decision was to narrow down (and perhaps even impair) the differences between public and private structures. Moreover, the external environment of the hospitals was analysed. Hence, the hospital network managed to generate and coordinate knowledge efficiently. Most relationships were formal (except for contributions to fight COVID-19 donated by associations or individuals). There is evidence that this could deduce *a priori* as the right to healthcare in the Italian legal system is recognised at the constitutional level. Additionally, if it is considered that the public sector (to which healthcare is assigned) is usually characterised hierarchically and bureaucratically (Durst *et al.*, 2020), further elements allowing the confirmation of the lack of informal relationships include the fact that only publicly available documents were used in the study. Therefore, these elements may have influenced the emergence of only formal relations.

The results highlighted that temporary relationships arose specifically during the emergency, and they were presumed to dissolve afterwards. At the same time, previously established relationships continued between the hospitals and the public organisations and between central and LG. Based on the findings on the management of the hospitals and relations during the emergency, the KM practices implemented during the crisis enabled the transformation of the components of the IC, which affected performances that were related (Pigola *et al.*, 2021). Therefore, these skills were used in the development of the IC to create value (Cabrilo and Dahms, 2018). The findings indicate that RC plays a reactive role during the emergency period and the KM could be considered strategic in health emergency management.

However, the most useful relationships found in the present study were those between the hospitals and Lombardy and between the hospitals and the central government. The change in management that the LGs experienced during the pandemic presumably made it possible to keep the pandemic under control despite its seriousness.

The limitations of the work are different. One of the limitations is related to the data collection. In fact, information on both hospitals was extracted from public documents available online. This limit is due to the period when the analysis was performed, and it could be traced back to three main issues:

(1) The lockdown was in place during the period of writing this work. In fact, the circulation restrictions and the dangers of the virus did not allow the writers to go to the selected places for the case study.

(2) The availability of the hospital staff. While the work was being written, hospital staff members were busy managing the emergency. Therefore, they were under pressure and did not have time to do anything else, such as attending interviews.

(3) When the analysis was performed, there was not the same efficiency, as it is now, in the knowledge and use of Information and Communication Technologies tools that make reducing the distances between people possible.

Although the results obtained from the study are generalisable, it is believed that the analysis could also be carried out by focussing on hospitals located in other European countries where the COVID-19 had different impacts and the emergency was managed differently. Therefore, future work could focus on the health sector in other European countries, perhaps through a comparative case study. A further work that could be interesting to carry out would be comparing the situation during the emergency phase and when state of emergency will be over by the use of the dynamic CAOS (Paoloni and Modaffari, 2022) as it is a useful approach for analysing the evolution of relations and studying the intangible resources in different periods.

Concluding, it is clear that the healthcare sector has a relevant role in society (Bevan *et al.*, 2010; Papa *et al.*, 2018). However, this industry is difficult to investigate because of its complexity (Orlando *et al.*, 2021). IC is an interesting topic because this sector is highly intensive and specialised (Kumar *et al.*, 2009).

The present work makes several theoretical and practical contributions. From a theoretical perspective, the work contributes to the literature on the little-explored topic of the relationship between IC and KM. The literature review revealed that although IC has received much attention in the past 20 years, correlations between its components and KM have remained unexplored. As demonstrated in the present work, both IC and KM were critical in health sector resilience during the emergency. In line with previous studies, in the present work, RC was confirmed as a factor in reactive resilience and this is also due to the role played by the KM.

Moreover, thanks to the CAOS model, namely the analysis of the relationships between hospitals (C), their internal organisational elements (O), their external environments (A) and their involvement during the emergency (S), the study showed that a "formal" approach to relationship development ensured the survival of the hospitals and the management of available resources. Another contribution of the present study is related to the use of the CAOS model. The model was applied in a multiple case study where the sector was compared with a previous study in which the same model was used.

From a managerial perspective, this study may help to rethink the management system of the healthcare sector, or at least support policy makers when the pandemic is over and they will need to reflect carefully on the complicated period they have had to face and they will be called upon to deal with the sums of what has been learnt during this terrible moment. The practical implications linked to the created relationships between the hospitals and the central government during the health emergency, could be a contribution to this

reconsideration. As explained in the body of the paper, during the pandemic, the interlocutor of the hospitals changed from the LG to the central government. Considering the Lombardy disaster, it is hoped that this learnt lesson in emergency management will inspire the legislator to reconsider and rethink the management of the health sector. All this should be done with a view to having a homogeneous treatment of patients affected by Covid throughout the national territory, without the legislative power of the regions being able in some way to influence the outcome of the emergency management. In fact, if the crisis had been managed individually by the LG (as it should have been following the decentralisation of the Italian national health system), it would most likely have resulted in an even greater disaster. Thus, it is hoped that S-A relations, which were interpreted as temporary, would become permanent or that this relation, could be seen as a formal and temporary connection. This statement is generalisable, as the effects would occur not only in the Lombardy, which was the setting of the present study, but in the entire national territory. Hospitals of different sizes and located in different geographical area, including peripheral areas, could benefit from this relationship. It is assumed that emergency management during the first months of 2020 may have led to the reconsideration of the decentralised Italian health system, which has been in place for 20 years (Paoloni *et al.*, 2020b).

References

Armocida, B., Formenti, B., Ussai, S., Palestra, F. and Missoni, E. (2020), "The Italian health system and the COVID-19 challenge", *The Lancet Public Health*, Vol. 5 No. 5, p. 253.

Arrow, K.J. (1963), "Uncertainty and the welfare economics of medical care", *The American Economic Review*, Vol. 53 No. 5, pp. 941-973.

Bain, J.S. (1968), *Industrial Organization*, Wiley, New York.

Benbasat, I., Goldstein, D.K. and Mead, M. (1987), "The case research strategy in studies of information systems", *MIS Quarterly*, Vol. 11 No. 3, pp. 369-386.

Berg, M. (2004), *Health Information Management. Integrating Information Technology in Health Care Work*, Psychology Press, Routledge, New York, NY.

Bevan, G., Helderman, J.K. and Wilsford, D. (2010), "Changing choices in healt care: implications for equity, efficiency and cost", *Health Economics, Policy and Law*, Vol. 5, pp. 251-267.

Buenechea-Elberdin, M., Sáenz, J. and Kianto, A. (2018), "Knowledge management strategies, intellectual capital, and innovation performance: a comparison between high- and low-tech firms", *Journal of Knowledge Management*, Vol. 22 No. 8, pp. 1757-1781.

Cabrilo, S. and Dahms, S. (2018), "How strategic knowledge management drives intellectual capital to superior innovation and market performance", *Journal of Knowledge Management*, Vol. 22 No. 3, pp. 621-648.

Capello, R. and Faggian, A. (2005), "Collective learning and relational capital in local innovation processes", *Regional Studies*, Vol. 39 No. 1, pp. 75-87.

Cillo, V., Gavinelli, L., Ceruti, F., Perano, M. and Solima, L. (2019), "A sensory perspective in the Italian beer market", *British Food Journal*, Vol. 121 No. 9, pp. 2036-2051.

Corbetta, P. (2003), *Social Research: Theory, Methods and Techniques*, SAGE Publications, Thousand Oaks.

Curado, C. (2008), "Perceptions of knowledge management and intellectual capital in banking industry", *Journal of Knowledge Management*, Vol. 12 No. 3, pp. 141-155.

Daou, A., Joseph, J., Yousif, D.S., Fathallah, R. and Reyes, G. (2019), "Intellectual capital and resilience in torn societies", *Journal of Intellectual Capital*, Vol. 20 No. 4, pp. 598-618.

Davenport, T.H. and Prusak, L. (1998), *Working Knowledge*, Harvard Business School Press, Boston, MA.

de Castro, G.M., Sáez, P.L. and López, J.E.N. (2004), "The role of corporate reputation in developing relational capital", *Journal of Intellectual Capital*, Vol. 5 No. 4, pp. 575-585.

Del Giudice, M. and Maggioni, V. (2014), "Managerial practices and operative directions of knowledge management within inter-firm networks: a global view", *Journal of Knowledge Management*, Vol. 18 No. 5, pp. 841-846.

Durst, S., Lindvall, B. and Bruns, G. (2020), "Knowledge risk management in the public sector: insights into a Swedish municipality", *Journal of Knowledge Management*, Vol. 24 No. 4, pp. 717-735.

Dyer, J.H. and Singh, H. (1998), "The relational view: cooperative strategy and sources of interorganizational competitive advantage", *Academy of Management Review*, Vol. 23 No. 4, pp. 660-679.

Eisenhardt, K.M. and Graebner, M.E. (2007), "Theory building from cases: opportunities and challenges", *Academy of Management Journal*, Vol. 50 No. 1, pp. 25-32.

Euroforum (1998), *Medición del Capital Intelectual: Modelo Intelect*, Instituto Universitario Euroforum Escorial, Madrid.

Ferraris, A., Santoro, G. and Scuotto, V. (2020), "Dual relational embeddedness and knowledge transfer in European multinational corporations and subsidiaries", *Journal of Knowledge Management*, Vol. 24 No. 3, pp. 519-533.

Ferreira, J., Fernandes, C. and Ratten, V. (2016), "A co-citation bibliometric analysis of strategic management research", *Scientometrics*, Vol. 109 No. 1, pp. 1-32.

Fiano, F., Sorrentino, M., Caputo, F. and Smarra, M. (2022), "Intellectual capital for recovering patient centrality and ensuring patient satisfaction in healthcare sector", *Journal of Intellectual Capital*, Vol. 23 No. 3, pp. 461-478, doi: 10.1108/JIC-04-2020-0116.

Grant, R.M. (1996), "Toward a knowledge-based theory of the firm", *Strategic Management Journal*, Vol. 17 No. S2, pp. 109-122.

Grasselli, G., Pesenti, A. and Cecconi, M. (2020), "Critical care utilisation for the COVID-19 outbreak in Lombardy, Italy: early experience and forecast during an emergency response", *JAMA*, Vol. 323 No. 16, pp. 1545-1546.

Habersam, M. and Piber, M. (2003), "Exploring intellectual capital in hospitals: two qualitative case studies in Italy and Austria", *European Accounting Review*, Vol. 12 No. 4, pp. 753-779.

Hansen, M.T., Nohria, N. and Tierney, T. (1999), "What's your strategy for managing knowledge?", *Harvard Business Review*, Vol. March-April, pp. 1-10.

Hansmann, H. (1980), "The role of nonprofit enterprise", *Yale Law Journal*, Vol. 89, pp. 835-901.

Heisig, P., Suraj, O.A., Kianto, A., Kemboi, C., Perez Arrau, G.P. and Fathi Easa, N. (2016), "Knowledge management and business performance: global experts' views on future research needs", *Journal of Knowledge Management*, Vol. 20 No. 6, pp. 1169-1198.

Hitt, M.A., Bierman, L., Shimizu, K. and Kochhar, R. (2001), "Direct and moderating effects of human capital on strategy and performance in professional service firms: a resource-based perspective", *Academy of Management Journal*, Vol. 44 No. 1, pp. 13-28.

Huang, H., Leone, D., Caporuscio, D. and Kraus, S. (2021), "Managing intellectual capital in healthcare organisations. A conceptual proposal to promote innovation", *Journal of Intellectual Capital*, Vol. 22 No. 2, pp. 290-310.

Hussinki, H., Ritala, P., Vanhala, M. and Kianto, A. (2017), "Intellectual capital, knowledge management practices and firm performance", *Journal of Intellectual Capital*, Vol. 18 No. 4, pp. 904-922.

Jia, J., Huang, X., Li, Y., Cao, J. and Alsaedi, A. (2019), "Global stabilization of fractional-order memristor-based neural networks with time delay", *IEEE Transactions on Neural Networks and Learning Systems*, Vol. 3 No. 3, pp. 997-1009.

Jia, X., Chowdhury, M., Prayag, G. and Chowdhury, M.M.H. (2020), "The role of social capital on proactive and reactive resilience of organisations post-disaster", *International Journal of Disaster Risk Reduction*, Vol. 48 No. 101614, pp. 1-12.

Johnson, N., Elliott, D. and Drake, P. (2013), "Exploring the role of social capital in facilitating supply chain resilience", *Supply Chain Management: An International Journal*, Vol. 18 No. 3, pp. 324-336.

Kaixuan, L.I. (2020), "Why the Italian NHS has rapidly reached its maximum capacity in COVID-19 pandemic?", *Report Series on Chinese and European Actions in Fighting against Coronavirus Disease (COVID-19)*.

Keong Choong, K. (2008), "Intellectual capital: definitions, categorisation, and reporting models", *Journal of Intellectual Capital*, Vol. 9 No. 4, pp. 609-638.

Kianto, A. (2007), "What do we really mean by the dynamic dimension of intellectual capital?", *International Journal of Learning and Intellectual Capital*, Vol. 4 No. 4, pp. 342-356.

Kianto, A., Ritala, P., Spender, J.C. and Vanhala, M. (2014), "The interaction of intellectual Capital assets and knowledge management practices in organisational value creation", *Journal of Intellectual Capital*, Vol. 15 No. 3, pp. 362-375.

Kumar, R., Panesar, S.S. and Markeset, T. (2009), "Development of technical integrity management services–a concept", *Journal of Quality in Maintenance Engineering*, Vol. 15 No. 3, pp. 271-284.

Kuminova, E. and Bykova, A. (2014), "Did relational capital matter during the financial crisis?", *International Journal of Learning and Intellectual Capital*, Vol. 11 No. 4, pp. 286-305.

Laihonen, H. (2012), "Knowledge structures of a health ecosystem", *Journal of Health Organization and Management*, Vol. 26 No. 4, pp. 542-558.

Lerro, A., Linzalone, R. and Schiuma, G. (2014), "Managing intellectual capital dimensions for organizational value creation", *Journal of Intellectual Capital*, Vol. 15 No. 3, pp. 350-361, doi: 10.1108/JIC-05-2014-0063.

Mariano, S. and Walter, C. (2015), "The construct of absorptive capacity in knowledge management and intellectual capital research: content and text analyses", *Journal of Knowledge Management*, Vol. 19 No. 2, pp. 372-400.

Mason, E.S. (1939), *Economic Concentration and Monopoly Problem*, Harvard University Press, Cambridge, MA.

McDonald, B. and Larson, S. (2020), "Implications of the coronavirus on sales tax revenue and local government fiscal health", *Journal of Public and Nonprofit Affairs*, Vol. 6 No. 3, pp. 377-400.

MERITUM (2002), *Meritum Guidelines for Managing and Reporting on Intangibles*, Vodafone Foundation, Madrid.

Ministero della Salute (2020), "DPI e apparecchiature, il punto sulla produzione e distribuzione", available at: http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioNotizieNuovoCoronavirus.jsp?lingua=italiano&menu=notizie&p=dalministero&id=4402 (accessed 27 April 2020).

Murray, A., Papa, A., Cuozzo, B. and Russo, G. (2016), "Evaluating the innovation of the internet of things: empirical evidence from the intellectual capital assessment", *Business Process Management Journal*, Vol. 22 No. 2, pp. 341-356, doi: 10.1108/BPMJ-05-2015-0077.

Nahapiet, J. and Ghoshal, S. (1998), "Social capital, intellectual capital, and the organisational advantage", *Academy of Management Review*, Vol. 23, pp. 242-266.

Nicolini, D., Powell, J., Conville, P. and Martinez-Solano, L. (2008), "Managing knowledge in the healthcare sector. A review", *International Journal of Management Reviews*, Vol. 10 No. 3, pp. 245-263.

Nonaka, I. and Takeuchi, H. (1995), *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press, New York.

Orlando, B., Ballestra, L.V., Magni, D. and Ciampi, F. (2021), "Open innovation and patenting activity in health care", *Journal of Intellectual Capital*, Vol. 22 No. 2, pp. 384-402, doi: 10.1108/JIC-03-2020-0076.

Paoloni, P. (2021), *The C.A.O.S. Model*, Giappichelli, Turin.

Paoloni, N., Mattei, G., Dello Strologo, A. and Celli, M. (2020a), "The present and future of intellectual capital in the healthcare sector: a systematic literature review", *Journal of Intellectual Capital*, Vol. 21 No. 3, pp. 357-379.

Paoloni, P. and Modaffari, G. (2022), "Business incubators vs start-ups: a sustainable way of sharing knowledge", *Journal of Knowledge Management*, Vol. 26 No. 5, pp. 1235-1261, doi: 10.1108/JKM-12-2020-0923.

Paoloni, M., Tutino, M., Mattei, G. and Paoloni, N. (2020b), "Le riforme del sistema sanitario nazionale italiano e gli impatti nella gestione della pandemia", in Paoloni, M. and Tutino, M. (Eds), *L'Italia ai tempi del Covid. Tomo II - CEDAM*, pp. 233-253.

Papa, A., Dezi, L., Gregori, G.L., Mueller, J. and Miglietta, N. (2018), "Improving innovation performance through knowledge acquisition: the moderating role of employee retention and Knowledge resources in the university context human resource management practices", *Journal of Knowledge Management*, Vol. 24 No. 3, pp. 589-605.

Papa, A., Mital, M., Pisano, P. and Del Giudice, M. (2020), "E-health and wellbeing monitoring using smart healthcare devices: an empirical investigation", *Technological Forecasting and Social Change*, Vol. 153 No. 119226, pp. 1-10.

Penrose, E. (1959), *The Theory of the Growth of the Firm*, Blackwell, Oxford.

Pereira de Souza, V., Baroni, R., Choo, C.W., Castro, J.M.d. and Barbosa, R.R. (2021), "Knowledge management in health care: an integrative and result-driven clinical staff management model", *Journal of Knowledge Management*, Vol. 25 No. 5, pp. 1241-1262.

Peteraf, M.A. (1993), "The cornerstones of competitive advantage: a resource-based view", *Strategic Management Journal*, Vol. 14 No. 3, pp. 179-191.

Pflugfelder, N.S. (2021), "Knowledge management as a driver of performance in ambulatory healthcare–a systematic literature review through an intellectual capital lens", *Journal of Intellectual Capital*, Vol. 22 No. 2, pp. 403-432.

Pigola, A., De Santi, P.V., da Costa, P.R. and Storopoli, J. (2021), "Intellectual capital on performance: a meta-analysis study enhancing a new perspective of the components", *Journal of Intellectual Capital*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/JIC-01-2021-0025.

Prasad, S., Su, H.C., Altay, N. and Tata, J. (2015), "Building disaster-resilience micro enterprises in developing world", *Disasters*, Vol. 39 No. 3, pp. 447-466.

Remuzzi, A. and Remuzzi, G. (2020), "COVID-19 and Italy: what next?", *The Lancet*, Vol. 395 No. 10231, pp. 1225-1228.

Ricci, A. and Tarricone, R. (2020), "Il sistema pubblico-privato alla prova del Covid-19", available at: https://www.lavoce.info/archives/64035/sanita-il-sistema-pubblico-privato-alla-prova-del-coronavirus/ (accessed 28 April 2020).

Ripamonti, C.A., Pasquarelli, L., Ravasi, S. and Sala, F.C. (2017), "Dropout of hospital volunteers in Italy", *VOLUNTAS: International Journal of Voluntary and Nonprofit Organisations*, Vol. 28, pp. 44-68.

Santacroce, L., Charitos, I.A. and Del Prete, R. (2020), "COVID-19 in Italy: an overview from the first case to date", *Electronic Journal of General Medicine*, Vol. 17 No. 6, pp. 1-8.

Santoro, G., Vrontis, D., Thrassou, A. and Dezi, L. (2018), "The Internet of Things: building a knowledge management system for open innovation and knowledge management capacity", *Technological Forecasting and Social Change*, Vol. 136, pp. 347-354.

Saviano, M., Barile, S., Spohrer, J.C. and Caputo, F. (2017), "A service research contribution to the global challenge of sustainability", *Journal of Service Theory and Practice*, Vol. 27 No. 5, pp. 951-976.

Scuotto, V., Del Giudice, M., Bresciani, S. and Meissner, D. (2017), "Knowledge-driven preferences in informal inbound open innovation modes. An explorative view on small to medium enterprises", *Journal of Knowledge Management*, Vol. 21 No. 3, pp. 640-655.

Seleim, A.A. and Khalil, O.E. (2011), "Understanding the knowledge management – intellectual Capital relationship: a two-way analysis", *Journal of Intellectual Capital*, Vol. 12 No. 4, pp. 586-614.

Serino, L., Papa, A., Campanella, F. and Di Gioia, L. (2020), "The sourcing for collaborative knowledge translation in distributed R&D processes: a cross-regional study", *Management Decision*, Vol. 58 No. 9, pp. 2027-2048.

Spina, S., Marrazzo, F., Migliari, M., Stucchi, R., Sforza, A. and Fumagalli, R. (2020), "The response of milan's emergency medical system to the COVID-19 outbreak in Italy", *The Lancet*, Vol. 395 No. 10227, pp. e49-e50.

Stewart, T.A. (1997), *Intellectual Capital: The New Wealth of Organisations*, Doubleday, New York.

Švarc, J., Lažnjak, J. and Dabić, M. (2021), "The role of national intellectual capital in the digital transformation of EU countries. Another digital divide?", *Journal of Intellectual Capital*, Vol. 22 No. 4, pp. 768-791, doi: 10.1108/JIC-02-2020-0024.

Thakur, R., Hsu, S.H. and Fontenot, G. (2012), "Innovation in healthcare: issues and future trends", *Journal of Business Research*, Vol. 65 No. 4, pp. 562-569.

Ting, I.W.K., Ren, C., Chen, F.-C. and Kweh, Q.L. (2020), "Interpreting the dynamic performance effect of intellectual capital through a value-added-based perspective", *Journal of Intellectual Capital*, Vol. 21 No. 3, pp. 381-401.

Weisbrod, B. (1988), *The Nonprofit Economy*, Harvard University Press, Cambridge.

Wernerfelt, B. (1984), "A resource-based view of the firm", *Strategic Management Journal*, Vol. 5 No. 2, pp. 171-180.

Wiig, K.M. (1997), "Integrating intellectual capital and knowledge management", *Long Range Planning*, Vol. 30 No. 3, pp. 399-405.

Yang, C.C. and Lin, C.Y.Y. (2009), "Does intellectual capital mediate the relationship between HRM and organisational performance? Perspective of a healthcare industry in Taiwan", *The International Journal of Human Resource Management*, Vol. 20 No. 9, pp. 1965-1984.

Yin, R.K. (2009), *Case Study Research: Design and Methods*, 4th ed., SAGE Publications, Thousand Oaks, CA.

Zack, M.H. (1999), *Knowledge and Strategy*, Butterworth-Heinnemann, Boston, MA.

Zoia, C., Bongetta, D., Veiceschi, P., Cenzato, M., Di Meco, F., Locatelli, D., Boeris, F. and Fontanella, M.M. (2020), "Neurosurgery during the COVID-19 pandemic: update from Lombardy, northern Italy", *Acta Neurochirurgia*, Vol. 28 Nos 1-2, pp. 1221-1222.

Further reading

Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99-120.

Cavicchi, C. (2017), "Healthcare sustainability and the role of intellectual capital. Evidence from an Italian Regional Health Service", *Journal of Intellectual Capital*, Vol. 18 No. 3, pp. 544-563.

Godfrey, P.C. and Hill, C.W.L. (1995), "The problem of unobservables in strategic management research", *Strategic Management Journal*, Vol. 16, pp. 519-533.

Harrison, J. and Thompson, S. (2015), *Strategic Management of Healthcare Organisations Strategic Management of Healthcare Organizations: A Stakeholder Management*, Business Expert Press, New York.

Peng, T.-J.A., Pike, S. and Roos, G. (2007), "Intellectual capital and performance indicators: taiwanese healthcare sector", *Journal of Intellectual Capital*, Vol. 8 No. 3, pp. 538-556.

Petersen, K.J., Handfield, R.B., Lawson, B. and Cousins, P.D. (2008), "Buyer dependency and relational capital formation: the mediating effects of socialisation processes and supplier integration", *Journal of Supply Chain Management*, Vol. 44 No. 4, pp. 53-65.

Rumelt, R.P. (1984), "Towards a strategic theory of the firm", in Lamb, B. (Ed.), *Competitive Strategic Management*, Prentice-Hall, Englewood Cliffs, NJ, pp. 556-570.

Santos-Rodrigues, H., Faria, J., Cranfield, D. and Morais, C. (2013), "Intellectual capital and innovation: a case study of a public healthcare organisation in Europe", *Electronic Journal of Knowledge Management*, Vol. 11 No. 4, p. 361.

Smith, K.G., Carroll, S.J. and Ashford, S.J. (1995), "Intra-and interorganizational cooperation: toward a research agenda", *Academy of Management Journal*, Vol. 38 No. 1, pp. 7-23.

Surveillances, V. (2020), "The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19)—China, 2020", *China CDC Weekly*, Vol. 2 No. 8, pp. 113-122.

Walecka, A. (2020), "Relational capital and an enterprise crisis in the light of expert opinion survey", in Demir, E., Bilgin, M.H. and Danis, H. (Eds), *Eurasian Business Perspectives*, Springer, Cham, pp. 39-58.

Corresponding author
Giorgia Mattei can be contacted at: giorgia.mattei@uniroma3.it