Intangible assets innovation through Health Technology Assessment. The case of the Italian Healthcare Organisations

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The use of Health Technology Assessment (HTA) for the evaluation of medical devices in healthcare organisations implies the creation of new knowledge to be combined with that stored in the human, relational, and structural dimensions of their Intellectual Capital (IC).
Therefore, HTA can represent a trigger for innovating the IC and this process can be influenced by external factors that can be reconducted to the Institutional Theory (IT). However, to the best of our knowledge, there are no studies in the literature analysing these aspects. By using the case study methodology, this work explores how the innovation of the IC dimensions is triggered by the use of the HTA tools, considering also the moderating role of the IT pillars.

Keywords: Institutional Theory, Knowledge Management, Intellectual Capital.

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Innovazione degli asset intangibili attraverso l'Health Technology Assessment. Il caso delle Aziende Sanitarie italiane

L'utilizzo dell'Health Technology Assessment (HTA) per la valutazione di dispositivi medici nelle organizzazioni sanitarie implica la creazione di nuove conoscenze che devono essere combinate con quelle immagazzinate nelle dimensioni umane, relazionali e strutturali del loro Capitale Intellettuale (IC).
Pertanto, l'HTA può rappresentare un impulso all'innovazione dell'IC e tale processo può essere influenzato da alcuni fattori esterni riconducibili ai pilastri della Teoria Istituzionale (IT). Tuttavia, a oggi, non esistono studi in letteratura che analizzino questi aspetti. Utilizzando la metodologia dello studio di caso, questo lavoro esplora come l'innovazione delle dimensioni dell'IC sia innescata dall'uso degli strumenti di HTA, considerando anche il ruolo moderatore dei pilastri dell'IT.

Parole chiave: Teoria Istituzionale, Gestione della Conoscenza, Capitale Intellettuale.

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S O M M A R I O

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1. Introduction and Theoretical Background

In the last two decades, growing research started investigating healthcare organisations as knowledge-based organisations in which the exploitation of cognitive resources becomes crucial to guarantee and satisfy the expectations of the plurality of stakeholders that get in touch with them (Cavicchi, 2017). Knowledge-related organisational activities are expressions of the bidirectional relationship between knowledge management (KM) and intellectual capital (IC) (Kianto *et al.*, 2017). Indeed, the stock of knowledge is embedded within IC components – human, relational, and structural – and is exploited through KM strategies, which enable the knowledge creation flow, this way fuelling the IC components in a virtuous cycle of value creation (Garcia-Perez *et al.*, 2020).

Nowadays, healthcare organisations are urged by actors of their own external institutional context – institutions and agencies like the European Public Health Commission and the European Network for Health Technology Assessment (EUnetHTA) – to use Health Technology Assessment (HTA) as a multidisciplinary and multidimensional tool to evaluate biomedical technologies to assess their sustainability at the economic, social, and organisational level (Belfiore *et al.*, 2020). Health Technology Assessment (HTA) is a rigorous and systematic approach that aims to evaluate from a scientific and societal perspective the value of health technologies, such as medical devices, diagnostic tests, and pharmaceuticals, in terms of benefits, harms, and costs. As such, it provides information for decision-makers to make objective and evidence-based decisions about adopting and using health technologies. According to the EUnetHTA, HTA is a form of health policy analysis that examines the translation of technologies into medical practice and assesses the clinical effectiveness, cost-effectiveness, the social, ethical, and legal impact of health technologies (Thokala *et al.*, 2018).

The literature provides several studies about the HTA's efficacy in improving healthcare decision-making and resource allocation. For instance, Neumann and Weinstein (2010) highlight how HTA can provide policymakers with evidence-based information on the costs and benefits of healthcare interventions and highlights the importance of using cost-effectiveness measures to guide decision-making. Kirkham *et al.* (2017) compare the impact of HTA on pharmaceutical funding decisions in Australia and Canada and conclude that HTA has positively improved the transparency and consistency of decision-making processes. Finally, Oliver *et al.* (2015) discuss the importance of evidence synthesis in HTA and argue that systematic reviews and meta-analyses are essential tools for synthesizing and evaluating the available evidence on healthcare interventions. Overall, these studies demonstrate the efficacy of HTA in improving healthcare decision-making and resource allocation and highlight the importance of evidence-based approaches to healthcare policy-making.

However, the correct implementation of HTA tools is critical, as for applying them healthcare organisations are required to have a certain level of

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knowledge. Indeed, their real usefulness is under investigation within the emerging literature (Teerawattananon *et al.*, 2021).

The HTA tools are many and differ considerably from each other. Specifically, they can be descriptive, based on economic-monetary measurements, based on multiple criteria, and quantitative (Lazzini, 2014). The full exploitation of HTA tools enables the combination of new knowledge with the existing corporate cognitive knowledge stored in the IC dimensions fuelling the knowledge creation flow over time (Buenechea-Elberdin *et al.*, 2018). Hence, HTA can be understood as a trigger for innovation of the IC dimensions within healthcare organisations. For instance, HTA could affect a) the organisation's human capital due to the collaboration need of internal multidisciplinary staff with different knowledge and capabilities, b) the relational capital in the pricing and reimbursement activities involving external stakeholders; and c) the structural capital in its correct implementation involving the procedures' re-engineering (Huang *et al.*, 2020).

Anyhow, the effect that HTA has on the above mechanisms – according to which the combination of new knowledge with the existing corporate cognitive knowledge embedded in the IC dimensions fuels the knowledge creation flow over time – is not straightforward. In this article we contend that the effectiveness of these mechanisms in terms of creation of new knowledge depends on the institutional context, in which healthcare organisations operate. Indeed, from the Institutional Theory perspective (Di Maggio & Powell, 1983), organisations adapt their processes and structures to the pressures exerted by the external context in order to gain legitimacy with their stakeholders. Notably, the legislative impositions of the regulatory pillar, the values and norms of the normative pillar, and finally the cultural and social beliefs of the cultural-cognitive pillar exert institutional pressure on organisations (Di Maggio & Powell, 1983). By referring to rules and laws, the regulative pillar requires a particular behaviour, otherwise, sanctions will be applied. The normative pillar incorporates values and norms that reflect societal expectations. Values represent what is socially desirable and take the form of standards against which the behaviour of organisations and organisational structures can be compared. In parallel, norms specify the socially accepted ways of pursuing the set values. Overall, this pillar outlines the socially accepted, and thus institutionalised, processes and structures as the correct way of operating. The cultural-cognitive pillar encompasses the cultural and social beliefs that are rooted and established as practices of good conduct in society (Deegan, 2014).

As reported in the research framework (Figure 1), the regulatory pillar can encourage the adoption of HTA mechanisms through legislative recommendations. Still, the effectiveness with which HTA contributes to creating new knowledge within the healthcare organisation could also depend on cultural, technological, and social factors that can be attributed to the cultural-cognitive and normative pillars. By embodying the political orientation, the level of technological development, the level of educational and professional training and the exposure and media

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impact in the institutional context, the cultural-cognitive pillar can influence how HTA is applied within an organisation and thus how effectively HTA can be exploited to innovate the IC. This is further explained by the influence of the professional orders and associations embedded in the normative pillar (Scott, 2013). Taken together, the cultural-cognitive and normative pillars contribute to shaping HTA as a socially accepted practice, increasing the effectiveness of the use of HTA within healthcare organisations. By doing so, these pillars could have a moderating role in the relationship between the HTA use and the innovation of the IC dimensions.

Although the potential of HTA is well recognised (Marsh *et al.*, 2018), no one has ever analysed how its use has innovated the three IC dimensions of healthcare organisations. Research has only recently begun to be interested in studying IC in the health sector (Paoloni *et al.*, 2020); hence, the relationship between HTA, KM, and IC is understudied in the literature. Most peer-reviewed papers in this field analyse the relationship between HTA and knowledge transfer (Paulin & Suneson, 2015). For instance, Formoso *et al.* (2022) agree in considering knowledge transfer as a crucial organisational component to improving the implementation of HTA procedures. Instead, Mueller *et al.* (2016) also believe in the capacity-building importance in healthcare organisations, as conducting HTA studies requires the management of different knowledge types. More recently, Huang *et al.* (2020) analyse, according to a dynamic perspective, the IC in healthcare organisations as a factor strictly correlated to knowledge transfer and identifies HTA as an element of innovation of the relational capital IC dimension.

Moreover, it will be no surprise that no one has ever studied the role played by the Institutional Theory pillars on the relationship between using HTA and the innovation of IC dimensions in healthcare organisations.

2. Research questions

Our goal is to address the HTA role as a trigger for innovation of the IC dimensions within healthcare organisations. This is significant because, being knowledge-based, healthcare organisations have to manage knowledge related resources stored in the IC dimensions and the HTA tools may

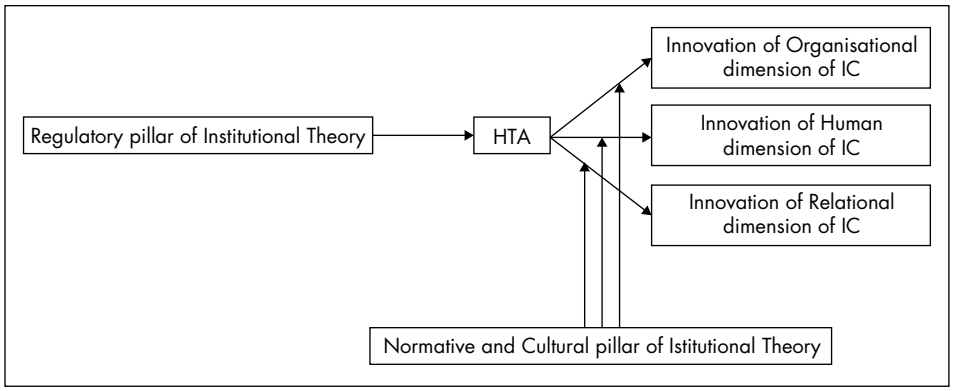

Figure 1
Research framework

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have a pivotal role in this task. Indeed, HTA may support the organisation in the existing knowledge exploitation and new knowledge creation in a virtuous cycle of value creation.
The research questions are the following:

- RQ1. How does HTA innovate the human, relational, and organisational dimensions of IC in healthcare organisations?
- RQ2. What is the role of the Institutional Theory pillars on the relationship between HTA and IC dimensions innovation?

3. Methodology

3.1. Case Selection

According to Gioia *et al.* (2013) and Yin (2013), the best way to gather data about a phenomenon under investigation is to face it within its real-life context. Therefore, we decided to perform an exploratory case study research.
To choose the cases studied, we operated an information-oriented selection, selecting the critical cases on the basis of expectations about their information content. Considering both the relevance features – organisations with a rooted and developed HTA activity were privileged – and cases accessibility – Italian organisations were privileged – we listed the Italian organisations participating in the EUNetHTA Network. Indeed, the focus on the Italian healthcare organisations allowed to investigate the organisations that belong to the same context, so preventing possible biases related to different institutional context pressures that, according to the Institutional Theory, may impact differently on the organisation's strategies.
The Italian members of EUNetHTA are seven (Table 1), and only two are healthcare organisations. Instead, the other five are national agencies or regional administrative centres.
As the activities, processes, and personnel differ significantly among healthcare organisations, agencies, and administrative/scientific centres, we decided to select only the Italian EUNetHTA members that are structured as healthcare organisations. So, we identified two eligible cases study.

Table 1 – Italian EUNetHTA members

Italian members of EUNetHTA	Typology
AGENAS National Agency for Regional Health Services	National Agency
AIFA Italian Medicines Agency	National Agency
CRUF Veneto Region – Social and Healthcare Area	Regional administrative centre
DGFDM Italian Healthcare Ministry	Ministry department
Emilia Romagna Region	Regional administrative centre
Agostino Gemelli Foundation in Rome	Organisation
Padua Healthcare Organisation	Organisation

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We decided to withdraw one of these two from the possible cases study list because of the current inactivity of its HTA unit due to the reorganisation of the regional healthcare system it belongs. This action pushed us to select one case study to investigate our research purposes.

In addition, to deal with the generalizability issue afflicting the case study methodology (Yin, 2013), we decided to contact another Italian healthcare organization, no EUNetHTA member but with a rooted HTA activity. The choice fell on a similar organization in terms of clinical, research and academic activities to the case already selected.

We contacted the HTA unit directors of the organisations, asking for her/his availability to be interviewed.

Table 2 summarizes the selected case studies.

The Case Study #1 is an Italian Scientific Hospitalization and Care Institute, founded in 1921, with 1558 beds. It is the biggest hospital in Italy and one of the biggest in Europe. According to the Newsweek ranking, it is the best Italian hospital for 2021 and 2022. Its activities are not just related to hospital assistance, but also to biomedical scientific research and medical and nursing courses degrees. The organisation's mission is to give patients humanity, excellence, and high care specialization, favouring continuous innovation in the medical field and training future healthcare professionals. Specifically, the organisation department contacted to carry out this study was the Operational Unit Complex for Health Technology, established in 2018 as part of an organizational restructuring to govern the hospital technological resources. It reports directly to the Clinical Governance Division and promotes the redesign of healthcare delivery paradigms, aiming for quality, equity of access, effective services for citizens, and economic sustainability of the hospital. The unit's function, which is guided by transparency, is advisory and deliberative, and it contributes to the institution's goals as a university research centre.

The Case Study #2 is an Italian Public Hospital Organisation, the seat of a University Faculty of Medicine. Since the 1970s, the organisation has represented a national and European point

Table 2 – Selected cases study

	Case Study features	
	Case Study #1	**Case Study #2**
EUNetHTA member	Yes	No
Headquarter	Rome, IT	Naples, IT
Employees	~5000	~3400
Beds	1558	1200
Main activities	Clinical, research and academic	Clinical, research and academic
HTA unit site	Complex Operational Unit for Health Technologies	Complex Operational Unit for Operational Management, Clinical Engineering and HTA, Information Systems and ICT

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of excellence for managing highly complex pathologies. The organisation's mission is to ensure continuity in the emergency-urgency of diagnostic and therapeutic services, contribute to the continuous training of health professionals, and support basic and translational biomedical research. According to the aim of this study, the organisation department contacted was the Clinical Engineering Service of the Complex Unit of Operational Management, Clinical Engineering and HTA, Information Systems and ICT. It ensures a secure, economical, and appropriate managerial process for the management of the healthcare technology assets of the Hospital. This includes the evaluation of biomedical technologies and related healthcare equipment according to HTA criteria, technical assistance and maintenance processes related to biomedical technologies and healthcare equipment, safety aspects and technological risk management related to their use.

3.2. Data Collection

We collected the primary data of our research through four semi-structured interviews conducted with the directors of the HTA unit of the selected cases and aimed to explore the phenomenon under investigation deeply.
According to Eisenhardt and Graebner (2007), we also considered secondary data sources to limit potential biases and ensure a better understanding of the phenomenon. So, we contemplated information from reports and white papers of HTA agencies, policy documents of Institutional bodies, online news articles, and documents from professional associations of the HTA field.
Table 3 resumes primary and secondary data sources; Table 4 shows the used questionnaire to conduct the interviews.
The interviews with the HTA unit directors of the selected cases study were conducted between the end of July 2022 and early September 2022.
During the interviews, we firstly collected information about the HTA activity of the organisations to confirm the selected cases' relevance for our research. Secondly, we asked the interviewees about the pressure of the IT regulatory pillar to adopt HTA tools and if and how the HTA tool's introduction and use had innovated or improved the organisations' IC. Thirdly, we explored the moderating role of the factors of the IT normative and cultural-cognitive pillars.
Each interview lasted about an hour, was conducted using Microsoft Teams platform by one of the authors and was recorded and transcribed verbatim.

Table 3 – Data sources

Primary Data	2 semi-structured interviews with the director of the HTA unit of the case study #1 2 semi-structured interviews with the director of the HTA unit of the case study #2
Secondary Data	Organisation website Professional Associations website Press articles Italian law and regulation

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Table 4 – Interview questionnaire

Constructs	Reference Literature
Health Technology Assessment	Adapted from: Wu and Hu (2012), Huang *et al.* (2020), and Scott (2013).
For which clinical and organizational processes does your organization use HTA tools? Why did your organization decide to make use of HTA tools (was it a mere fulfilment of requests from national/European bodies/institutions)? Which HTA tools does your healthcare organization use? Are you aware of the HTA tools used by other healthcare organizations in the same institutional context as your organization?	
Human Capital	
How the introduction and use of HTA tools innovated the skills of the clinical and administrative staff? How the introduction and use of HTA tools innovated the know-how of the clinical and administrative staff? How the introduction and use of HTA tools enhanced the talent of the clinical and administrative staff? Does the staff skills and know-how innovation pursued by the use of HTA depend on factors specific to the institutional context in which your organisation operates?	
Relational Capital	
How the introduction and use of HTA tools improved the knowledge of the healthcare market owned by your healthcare organisation and relations with external stakeholders involved in HTA processes? How the introduction and use of HTA tools improved the understanding of the organisation's choices and strategies by external stakeholders? Does the innovation of the relational capital (in terms of new knowledge on the healthcare market, new relations with the external stakeholders, and a renovated understanding of the organisation's choices and strategies by external stakeholders) pursued by the use of HTA depend on factors specific to the institutional context in which your organisation operates?	
Structural Capital	
How the introduction and use of HTA tools innovated the Information Technology infrastructures to support your healthcare organization's strategies and clinical and administrative processes? Does the innovation of the clinical and administrative processes pursued by the use of HTA depend on factors specific to the institutional context in which your organisation operates?	

According to Bourgeois & Eisenhardt (1988), the author who conducted the interview cross-checked data and shared his initial ideas; to maintain a high-level perspective, as indicated by Gioia *et al.* (2013), the rest of the authors critically reviewed the observations.

Also, to address potential information bias, we assured anonymity to the informant and complemented the interview with archival and observational data (Bingham & Eisenhardt, 2011).

4. Results

The interviews with case study #1 confirmed the relevance of HTA in the organisation. Indeed, since 2000-2001, HTA tools were used to evaluate medical devices, drugs, and complex projects, producing 50-60 HTA reports/year. Instead, despite a rooted knowledge about HTA approach, case study #2 produce only 2 to 3 HTA reports/year.

As one of the European precursors in implementing HTA, case study #1 was already equipped with evaluation tools

MECOSAN – ISSN 1121-6921, ISSNe 2384-8804, 2022, 124 DOI: 10.3280/mesa2022-124oa15957

when the National and International Institutions asked healthcare organisations to build on HTA in their decision-making processes. Therefore, no mandatory regulatory pressures influenced or obliged them to adopt HTA tools. This assertion is also reflected in the interviews with case study #2, which highlighted that the European recommendation is not a legal obligation; hence, in the interviewee's opinion, the healthcare organisations don't feel it as a mandatory regulatory pressure.

Despite both hospital HTA units use many tools – e.g., cost-effectiveness analysis and multi-criteria methodologies – tools that allow making decisions in the shortest possible time are preferred, because of the pivotal role time has in the healthcare context.

As regards the HTA tools impact on the innovation of the IC dimensions, three main results emerged from the interviews with both the cases.

Firstly, it emerged that the people skills, know-how, and talent were innovated (human capital). This has been true not only for the operators of the HTA unit, but also for the organisation's administrative and clinical staff: the former started using new methodologies/software and improving their analysis capabilities; the latter changed in terms of critical thinking and flexibility:

"Before [introducing HTA], the clinician defended the solution (medical device, drug or other technology) (s)he had in mind as if it was the best choice. Today [after HTA was introduced], clinicians are open to evaluating alternative solutions, even very different from those they had in mind. This change of mentality is the basis of more virtuous evaluation processes" (Case study #1).

Secondly, also the relational dimension of the IC has been innovated by the HTA. On the one hand, while looking for alternative technologies required to implement HTA procedures and hence while being updated about technological development, the organisations improved their understanding of the healthcare market. On the other hand, the device manufacturers improved their knowledge about how the organisations implements HTA processes and what is valuable to them:

"Today, the market knows that we have an approach that aims to check for possible alternatives, the differences, the overlaps, the possibility of using and experimenting a series of solutions that the market offers. In addition, the market interprets our organisation as a place where new technologies can be tested and assessed. So, from this point of view, it finds our organisation as a natural habitat" (Case study #1).

Not all the types of external stakeholders understand the technological choices and strategies undertaken by the healthcare organisations. On the one hand, medical device manufacturers and pharmaceutical companies have remarkably improved their understanding on how the hospitals make decisions: the use of HTA tools has clarified what methodologies are implemented and the evaluation criteria. On the other hand, the patients' and citizens' understanding of the organisations' strategies in terms of new technologies has not improved despite the efforts to communicate with their associations and representatives:

"It is not always possible to make the patient understand the organisational effort behind the choice of a new technol-

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ogy unless they are linked to marketing logic, which I find inappropriate regarding health" (Case study #1).

Lastly, it emerged that the IC's structural dimension has also been innovated using HTA tools. Indeed, the collaboration between the administrative and clinical people is remarkably improved: the HTA processes are structured on the basis of the complexity of the assessed technology. But, regardless of this, every process requires multidisciplinary work. So, the hospitals have set up a series of commissions and working groups that allow collaboration between different actors and the improvement of problem-solving activities.
Furthermore, the IC's structural dimension has also been innovated about the technological aspect. Indeed, because the proper implementation of the HTA procedures requires understanding the decision-making context through previous knowledge and internal information, the organisations have introduced new business intelligence tools to retrieve them.
As regards the role of the Institutional Theory pillars on the relationship between HTA and the innovation of the IC dimensions (RQ2) the informants confirmed that the effectiveness of the innovation of the human and relational dimensions of the IC also depends on external social factors attributable to the context to which the organisations belong.
In particular, the interviewee of case study #1 focused on the experience lived during the Covid-19 pandemic and on how this experience forced all the National Healthcare System organisations to share the HTA processes, in terms of HTA methodologies and practices, more closely.

Many organisations have innovated their human capital and relational one from this sharing. The human capital was innovated by increasing the knowledge, facing new challenges, and improving the skills and know-how of the staff through the use and implementation of new methodologies to carry out HTA-specific Covid-19-related activities. While, trivially, the relational capital was innovated by starting these new external collaborations among the organisations.
On the other hand, the interviewees underlined that the political orientation of the external context also represents a factor that can influence the relationship between HTA and the IC structural dimension. Specifically, the interviewee of case study #1 argued that only if political leadership believes in the utility of HTA tools, it funds and adequately supports the re-engineering and digitization projects that can foster and support HTA processes.
The synergies gained within the same historical period, and the right mentalities have embraced specific logics:

"You can have the most effective evaluation staff, but if you have a political leadership which believes that HTA activity is useless, you are not going anywhere. In recent years, we have had difficulties and good moments in which the total convergence and awareness of the HTA tools' usefulness allowed launching and regularly using them" (Case study #1).

Referring to the political orientation factor of the external context, the interviewees highlighted how digitalisation achieved a leading role in the Italian political agenda. In particular, the 2030 agenda emphasizes that one of the political objectives is the digital-

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isation of health processes. It is reasonable to think that greater digitalisation of processes (mainly administrative) has positively moderated, accelerating the effectiveness of the innovation of the organisation's structural capital by the HTA.

The informants explained that another external factor that has positively impacted on the effectiveness of the IC dimensions' innovation through the implementation of HTA approach is the formative role of the associations of the professionals involved in the evaluation processes of medical technologies, such as that of Italian Clinical Engineers (AIIC) and Hospital Pharmacists (SIFO).

For more than a decade, these associations have been organizing training courses about HTA. So, the staff of health organisations participating in these events are aware of methodologies for evaluating medical devices and drugs.

The formative role of these associations exerted a positive moderating role between the use of HTA and the innovation of IC dimensions. Specifically, it accelerates the innovation of the IC human dimension in terms of skills and know-how.

During their conferences, these associations also regularly organize stands and meetings among professionals, pharmaceutical companies, and manufacturers of medical devices. So, all these activities promote a more significant and continuous knowledge of the healthcare market by the staff of the healthcare organisations and therefore positively moderate the relationship between HTA and the innovation of the IC.

Finally, the interviewees underlined that patient's expectations and the media impact of the choices made by healthcare organisations represent a stimulus to implement more efficient evaluation processes. So, both these factors positively moderate the relationship between HTA and the innovation of the IC.

Table 5 resumes the main research results.

Table 5 – Main results

How does HTA tools innovate the human, relational, and organisational dimensions of IC in healthcare organisations?		
Human Capital Innovation	**Relation Capital Innovation**	**Structural Capital Innovation**
– Using new methodologies/software – Improving analysis capabilities – Improving critical thinking and flexibility	– Improving healthcare market understanding by the organisation – Getting the device manufacturers acquainted with the HTA organisation strategy – Establishing new external collaborations	– Improving collaboration among clinical and administrative staff – Improving problem-solving activities by new groups of work – Introducing new business intelligence tools
What is the role of the Institutional Theory pillars on the relationship between HTA and IC dimensions innovation?		
Regulative Pillar	**Normative Pillar**	**Cultural-cognitive Pillar**
– No mandatory regulatory pressures influenced or obliged the organisations to adopt HTA tools	– The formative role of professional associations	– Patients' expectation – Media impact of the organisation choices – The external context digitalisation – Social factors of the external context (Covid-19) – The political orientation of the external context

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5. Discussion and Conclusions

This study explores how using HTA innovates the IC dimensions of healthcare organisations and the role exerted by the IT pillars on the relationship between HTA and the IC dimensions. From a theoretical perspective, this qualitative analysis improves the under-studied relationship between HTA and IC in healthcare.

The cases studied underpin that HTA is a trigger of the innovation of the IC dimensions of healthcare organisations. In particular, they clarify that all IC dimensions of healthcare organisations were innovated using HTA. Hospital personnel involved in HTA processes have innovated and improved their skills, know-how, and talent that according to Huang *et al.* (2020) are elements of the IC human dimension. The IC relational dimension was innovated in terms of new external collaborations and a more understanding of the healthcare market by the organisation and the organisational strategy by devices manufacturers that hence can offer products better tailored to the hospital's needs. Finally, implementing the HTA processes has required the organisations to establish new internal collaborations and use new technologies, innovating in this way some elements of the IC structural dimension (Huang *et al.*, 2020).

In addition, this work enriches the literature exploring the role of IT on the relationship between HTA use and IC dimensions innovation.

On the one hand, the case studies don't confirm the supposed coercive pressure – of the regulative IT pillar – pushed by European Institutions and Agencies to adopt HTA tools. On the other, the case studies confirm that external factors – belonging to normative and cultural-cognitive pillars of the IT – show a moderating positive role between HTA use and IC dimensions innovation. Among these factors, the social ones, the role of professional associations, the political orientation of the external context, and the patients' expectation (Scott, 2013) accelerate the innovation of the IC dimensions pursued by using HTA tools.

From a practical point of view, managers and policymakers can lever HTA procedures and processes to increase the intangible assets of their organizations. Indeed, this work introduces practitioners to a new and little-known function of the HTA tools as an IC innovation trigger. They can adopt HTA to evaluate medical devices and drugs in their organizations, according to the requests of Institutions and Agencies of the contest, aware of favouring the innovation and exploitation of the cognitive resources of the organizations.

Furthermore, our findings also have social implications. The innovation of the IC dimensions through HTA tools within the organisation can generate positive effects on the whole healthcare system regarding service provision. Indeed, a more systematic adoption of the HTA guarantees a careful, accurate, and more quickly selection of technologies that make access to the healthcare service easier, improving its fruition and quality.

In line with previous literature (Neumann & Weinstein, 2010; Kirkham *et al.*, 2017; Oliver *et al.*, 2015), this work confirms the efficacy of HTA in improving healthcare decision-making. It also adds to this literature debate a novel perspective on how

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HTA can favour this improvement by means of IC innovation. Specifically, our research shows that to effectively exploit HTA to innovate IC, more than a stronger regulation is needed. According to the normative and cultural-cognitive pillars (Behzadifar *et al.*, 2023; Radaelli *et al.*, 2014), the HTA approach should be shaped as a socially accepted practice able to routinize the decision-making process. The routinisation of the HTA processes depend on the level of technological development of the context, educational and professional training of the context staff, the political orientation of the context, the expectations of stakeholders, the exposure and media impact (cultural-cognitive pillar), and the role of professional orders and associations (normative pillar). Healthcare organisations by using the HTA approach over time build a bundle of routines that innovate and enhance IC dimensions gradually.

The main limitation of this work is related to the qualitative research features and the results generalizability issue. Using case study methodology and conduct a few interviews are actually critical and weakness points of this research. However, the cases study and interviewees relevance allow us to take the first exploratory steps in a literature field totally unknown. Furthermore, the use of the IT lens allows us to prudentially extend the results to all the organisations that belong to the same institutional context of the selected and analysed case studies.

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