

# Intellectual Capital and BI-tools in Private Healthcare Value Creation

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**Abstract:** The demand for data-driven decision making in the healthcare sector has increased, not only on the clinical side, but also from the managerial perspective; this is especially true in the private healthcare sector. Utilisation of internal and external data requires certain capabilities, such as intellectual capital (IC), as different data sources (structural capital) and organisational competences (human capital) can become organisational value. We study the utilisation of business intelligence (BI) tools and IC dimensions in creating value in the Finnish private healthcare sector.

IC components and a modified value creation capabilities model are used as a framework for considering data utilisation and BI tools' role in value creation. Our study includes private healthcare organisations in Finland and management and BI technology consulting representatives. Thematic interviews of key personnel responsible for BI were conducted to elucidate the value creation capabilities, IC components and BI tool utilisation in the Finnish private healthcare industry.

Data-driven decision making is currently one of the most discussed topics in private healthcare sector organisations. By analysing the current data source utilisation and organisational competences in data utilisation, we gain a better understanding of IC and BI tool-enabled value creation in private healthcare organisations.

The study's outcomes will provide valuable information and a deep understanding concerning the influence of BI tools and IC dimensions on value creation in private health care in Finland. In addition, it will provide insight into future-oriented value creation factors that can enable new business concepts for private healthcare companies. Advanced capability of data utilisation will increase the value creation ability in private healthcare sector companies. However, in addition to the technology and data, human capital or capability of BI tool utilisation and data-driven decision making are crucial.

**Keywords:** Private healthcare, business intelligence, intellectual capital, value creation, external data sources

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## 1. Introduction

The amount of data in the healthcare that are being generated, captured, processed and analysed is expanding significantly. It has been widely recognised that not only are the amounts of clinical data growing, but operative business data are also being used to support organisational decision making (Raghupathi, 2010; Raghupathi and Raghupathi, 2014; Spruit, Vroon and Batenburg, 2014; Grierson, Corney and Hathcher, 2015). The same demand has been identified in the private healthcare, where organisations are seeking to enhance their understanding of business practices and related organisational data, as well as their operational environment, to enable better performance via enhanced decision making (Demirkan, 2013; Ratia and Myllärniemi, 2017; Ratia, et al., 2017).

In private health care, the interest in efficient data utilisation and the business intelligence (BI) tools enabling exploration and utilisation of organisational data has increased (Elbashir, et al., 2013). In addition, there has been a growing interest in identifying necessary data sources, not only for supporting organisational decision making but also combining external data sources, open data among others, with the organisational data, and creating the potential for new business opportunities, and thus, value (Ratia and Myllärniemi, 2017). In contrast, utilisation of both internal and external data requires certain capabilities, such as intellectual capital (IC) dimensions, namely data (structural capital) and competences (human capital), to succeed. The significance of data utilisation has been growing and creating the need to transform the data-related IC dimensions into organisational value; this has brought up a managerial approach of IC dimensions, related to

human and structural capital, on how to utilise IC in the management of the organisation (Dumay and Garanina, 2013; Lerro, Linzalone and Schiuma, 2014).

The paper aims to examine the role of IC dimensions, and more specifically, structural (data) and human capital (competences), as well as utilisation of BI tools in data-driven value creation in the private healthcare sector in Finland. In this paper, various data sources and BI tools are considered as a part of structural capital, and BI tool utilisation and competence are viewed as human capital dimensions. This study brings together qualitative empirical data on competences available for BI tool use and data source utilisation, combined with a theoretical framework, for exploring the potential of external data sources' value-creating rationale.

The applicable selection of BI tools and capabilities is an important aspect in the field of private healthcare, but there are not many previous studies that have examined this issue (Suomi and Tähtkää, 2002; Wullianallur and Vijju, 2014; Ratia and Myllärniemi, 2017). In addition, the role of IC dimensions in the value creation potential in the private healthcare sector remains unclear. By exploring the IC dimensions and BI utilisation in the context of private healthcare, the research brings novel value for private healthcare sector companies, as well as consulting organisations providing competence, for the value-creation potential. The practical outcome of this research will provide valuable information and a deep understanding concerning the role of BI tool utilisation competences and data sources in private healthcare in Finland. In addition, it will provide insights into the value creation potential that those IC dimensions can create for private healthcare companies.

In the second section of the paper, the aim is to show a conceptual basis for IC and BI, as well as a modified model of value creation capabilities (Möller, Rajala and Svahn, 2005; Ratia and Myllärniemi, 2017). Section 3 presents the empirical setting, introducing the methodology and empirical material. Section 4 shows the results of data-driven value creation in the Finnish private healthcare sector. Finally, in section 5, the conclusions and discussion complete the paper.

## **2. BI tools creating value by IC in the private healthcare**

### **2.1 The concept of IC**

The connection between organisational knowledge and intellectual capital has been considered in several previous studies. The first one to introduce IC was Galbraith (1969), who considered it a form of knowledge, intellect and brainpower activity to create value utilising knowledge (Galbraith, 1969; Shih, Chang and Lin, 2010). In addition, intellectual capital can be the sum of all the knowledge organisations use to gain a competitive advantage (Nahapiet and Ghoshal, 1998; Youndt, Subramaniam and Snell, 2004; Subramaniam and Youndt, 2005; Wang, Wang and Liang 2014). However, there can still be defined the two different focusses between them. IC can be seen focussing on intangible resources and knowledge management (KM) concerning knowledge-related processes and management activities (Edvinsson and Malone, 1997; Sullivan, 1998; Gold, Malhotra and Segard, 2001; Lee and Choi, 2003; Heisig, 2010; Spender, et al., 2013; Kianto, et al., 2014). The literature has introduced several IC definitions; one of the most typical, which is also used in this research, is dividing the intangible resources into three dimensions – human, structural and relational capital (e.g. Bontis, 2001; Guthrie, 2001; Ling, 2013; Kianto, et al., 2014).

Human capital refers to employee competences or capabilities, such as skills, training, education, experience and professional know-how (Dzinkowski, 2000; Shih, Chang and Lin, 2010; Ling, 2013; Kianto, et al., 2014). Structural capital can be viewed as organisational processes and flows, supply chains, systems and databases (Shih, Chang and Lin, 2010; Kianto, et al., 2014). Relational capital refers to the relationship networks and interactions between all related parties and stakeholders (Roos, Bainbridge and Jacobsen, 2001; Shih, Chang and Lin, 2010; Kianto, et al., 2014). Therefore, normatively, IC can be conceptualised into three separate elements that accumulate and distribute knowledge differently (Subramaniam and Youndt, 2005). In addition, the literature presents people (human capital), systems and procedures (structural capital) as a requirement for everyday organisational activities, along with organisational interactions between internal and external stakeholders (relational capital; Rossi and Magni, 2017). The evolution of IC research has moved from understanding IC's potential in creating and managing a competitive advantage, profit-driven IC and accountingisation, toward a more strategic managerial approach (Petty and Guthrie, 2000; Dumay, 2009; Chiacchi and Dumay, 2015).

The discussion of organisational knowledge and IC also refers to a List of Operational Knowledge Assets (LOKA), which identifies several areas of contribution into organisational data, information and knowledge, namely market capital, human capital, decision effectiveness, organisational capital and innovation and customer capital (Andreou, Green and Stankosky, 2007; Erickson and Rothberg, 2014). The approach clearly illustrates that information and data are a solid part of the discussion. In addition, BI and BI tool utilisation are naturally part of both organisational knowledge and IC discussions (Erickson and Rothberg, 2014). Edvinsson and Sullivan (1996) describe organisational knowledge as knowledge that can be converted into value. This can include knowledge, systems and data processes (Edvinsson and Sullivan, 1996).

## 2.2 BI and utilisation of external data sources

The notion of BI has several definitions that supplement each other, enabling overall understanding of the BI concept. It can be viewed as a combination of different tools, applications and methods (Turban, et al., 2008). Nykänen, Järvenpää and Teittinen (2016) is separating BI into two main streams: technological and process. In addition, from a broader perspective, BI can include many concepts that are relatively close to each other, such as competitive intelligence, market intelligence, customer intelligence, competitor intelligence, strategic intelligence, technical intelligence and data analytics (Hannula and Pirttimäki, 2003; Lönnqvist and Pirttimäki, 2006; Kimble and Milolidakis, 2015). In addition, BI can be a managerial activity and have a strategic goal in terms of collecting raw data, evaluating the validity and reliability of data, analysing and storing data and sharing the processed information to support the organisational decision makers, thereby affecting the value creation (Gilad and Gilad, 1985; Pirttimäki, 2006; Nykänen, Järvenpää and Teittinen, 2016).

In addition to a process or management approach, in the literature, BI has been described as a selection of techniques, such as statistical methods and data mining, technologies, tools, practices, methodologies and applications, enabling the business data analysis required for a better understanding of the business and market. As a result, it leads to data-driven decision making by providing comprehensive, timely information (Hannula and Pirttimäki, 2003; Chen, Chiang and Storey, 2012; Côte-Real, Ruivo and Oliveira, 2014; Nykänen, Järvenpää and Teittinen, 2016; Ratia and Myllärniemi, 2017). Simply, BI is business' ability to utilise the available data and employ it (Kimble and Milolidakis, 2015). To benefit from BI utilisation, organisations need proper tools to enable data analysis. BI tools, such as data warehouses and data mining tools, support the different stages of data-driven decision making as efficiently as possible, simultaneously bringing value to the organisation. Real-time, flawless information access to support decision making is critical, and the amount of information in organisations is growing rapidly, thereby creating challenges for data processing, which requires specific tools to enable knowledge and value creation to the organisation (Hannula and Pirttimäki, 2003; Jinpon, Jaroensutasinee and Jaroensutasinee, 2011; Ratia, et al., 2017). Overall, BI includes people, processes and technology, as well as the knowledge and end product (Hannula and Pirttimäki, 2003; Shollo and Galliers, 2016).

Like BI, KM has multiple definitions; one is that it is a set of practices concerning the creation, development and application of knowledge in terms of organisational performance. Both KM and BI improve the utilisation of available information and knowledge, as well as processing unstructured information, along with tacit knowledge (Wang and Wang, 2008). However, the concepts of BI and KM are not identical. The purpose of BI tools is supporting the decision-making process, whereas KM technologies can be viewed as knowledge and content management for storing, distributing and analysing structured and unstructured information (Herschel and Jones, 2005). Although KM has many different definitions in the literature, one clear aspect can be identified that differentiates it from BI: It contains subjective human knowledge that is not data for objective information (Davenport and Seely, 2006; Wang and Wang, 2008). However, BI and KM are deeply influenced by each other (Wang and Wang 2008).

IC dimensions – more specifically, structural capital, such as data – can be a valuable asset for organisations. In contrast, the value of BI tool utilisation is created by connecting different data types from different sources, allowing businesses to collect, evaluate, analyse, store and share up-to-date data to be used efficiently in decision making. The role of external sources in creating strategic opportunities and new potential sources of revenue has grown significantly (Zahra and George, 2002; Denrell, Fang and Winter, 2003; Foss, Lyngsie and Zahra, 2013). In the context of healthcare, external data can comprise social media posts, including Twitter feeds, blogs, status updates on Facebook and other platforms and webpages; or less patient-specific information, including emergency care data, newsfeeds and articles in medical journals. For example, utilising external data and applying advanced analytics to patient profiles would benefit from proactive care to

preventive care (Raghupathi and Raghupathi, 2014). Consequently, BI utilisation can include both internal and external data sources, where they can be used separately or together, creating new data and information, and thus, value.

### **2.3 IC creating value in private health care**

Data and the ability to connect different data sources can be considered valuable from an organisational point of view, as it enables a data-driven approach. However, the concepts of value and value creation and their importance in the context of business decision making can be considered multilateral. When considering an extended perspective, the concept of value can be described in terms of a trade-off between benefits and sacrifices (Parolini, 1999; Lapierre, 2000; Hugos and Hultitzky, 2011; Ojala and Helander, 2014; Ratia and Myllärniemi, 2017). These trade-offs between benefits and sacrifices can be divided into monetary terms, such as productivity and efficient resource utilisation, as well as non-monetary terms, such as competence, market position, social rewards, time, effort and energy (Hagen and Hagsten, 2006; Nordgren, 2009; Myllärniemi and Helander, 2012; Ojala and Helander, 2014). In this research, we mostly focus on data-driven value creation enabled by IC dimensions, more specifically, human and structural capital.

The data-driven approach is strongly related to the discussion of IC value creation. In addition, data and knowledge are crucial drivers for an organisation's performance and value creation (Hussinki, et al., 2017). In addition, an organisation's capability to innovate has a close relation to its IC and ability to utilise it (Subramaniam and Youndt, 2005; Pirozzi and Ferulano, 2016). The role of capabilities has been central in the IC discussion, as has the effect of IC on value creation in organisations, although IC is a multilateral topic with no exact definition (Moustaghfir and Schiuma, 2013; Secundo, et al., 2017). Mostly, the literature divides the IC research into two interpretations: the conceptual, passive and categorisable, measurable assets and the dynamic, interpreting IC from a process or capability perspective (Edvinsson and Malone, 1997; Sullivan, 1998; Bontis, 2001; Guthrie, 2001; Kianto, et al., 2014; Pirozzi and Ferulano, 2016). Overall, IC can be defined as a sum of the intangible and knowledge-related resources that organisations can use to create value (Kianto, et al., 2014). Organisational IC consists of immaterial resources, such as human capital, structural capital and relational capital, creating value for the organisation (Kujansivu and Lönnqvist, 2005; Secundo, et al., 2017). Out of these, human capital and structural capital are the focus and basis for value creation in this paper. Moreover, the organisational competence of BI tool utilisation, as well as the utilisation of external data sources and its combination with the organisational data to create value.

Knowledge processes and methods, like BI, should be tightly connected to healthcare organisations' service provision and value creation (Myllärniemi and Helander, 2012). To clarify the BI tools' meaning in value creation and the link to IC, we use a network-capability-base framework as the foundation our analysis, as modified for the private healthcare sector (Möller, Rajala and Svahn, 2005; Ratia and Myllärniemi, 2017). However, the conducted analysis was based on qualitative research, which was supported by the analysis. In addition, it shows how IC dimensions are connected to data-driven value creation and the linkage to utilisation of external data sources and organisational capabilities or competences in BI tool utilisation.

## **3. Methods**

This research was carried out using qualitative research methods and a case study research strategy. The research strategy, multiple case studies performed with qualitative research methods, was chosen for its suitability for studying complex and context-dependent research topics (Yin, 2003). In total, 26 thematic interviews were conducted for the study between January and October 2017. The companies were chosen to represent different sizes of private healthcare organisation, management consulting companies and technology consulting companies operating in Finland to accomplish potentially different viewpoints of data and BI utilisation. The research proceeded by conducting semi-structured thematic interviews, which were time-intensive, face-to-face interviews and Skype interviews, as the interviewees were executives and high-level managers and consultants on a tight schedule. The questions in the thematic interviews related to the connection of different data sources and organisational competence to value creation. The interviews were recorded and transcribed to enable systematic organisation and analysis of the gathered data (McLellan, MacQueen and Neidig, 2003). The qualitative approach provides better explanations and understanding of the research topic, also enabling adjusted questions, and as a result, more information, than if a quantitative study had been conducted (Yeoh and Koronios, 2010; Nykänen, Järvenpää and Teittinen, 2016). The flexible

approach to semi-structured interviews allows information to be gathered effectively and conveniently (Qu and Dumay, 2011).

Private healthcare companies involved in the case study were engaged in business activities in the healthcare, social care and dentalcare parts of the healthcare industry. The consulting case companies involved in the research were engaged in management consulting and technology consulting. Furthermore, the companies were located all over Finland. In addition, Finnish companies and international companies with offices in Finland were included. To identify the relevant private healthcare and consulting organisations for this research, it was necessary to gather multiple open-source documents about the companies' backgrounds and analyse whether they would be suitable for the research.

From the private healthcare sector, the interviewees were top managers and directors, representing mostly information and communication technology (ICT) or financial organisational functions; they were selected to be involved in the research based on their area of responsibility for BI in their organisations. Private healthcare companies with a turnover of over 40 million euros per year (as of 2015) were chosen for the study. The list of interviewees, their position in the organisation and their primary areas of responsibility are presented in Table 1.

**Table 1:** List of Interviewees, Organisational Positions and Areas of Responsibility

Interviewee	Position in the organisation	Area of responsibility
1	Director, Information and Communication Technology (ICT)	Head ICT functions
2	Director, Digital Services	Head of Digitalization
3	Head of Information Technology (IT)	Head of ICT functions
4	Development Manager	Responsible for business intelligence (BI) and development
5	Chief information officer (CIO)	Head of ICT functions
6	Head of Accounting and Reporting	Head of Controlling and BI
7	Director, Digitalization	Head of ICT and Digitalization
8	ICT Manager	Head of ICT
9	Head of Controlling	Head of Controlling and BI

The interviews were conducted in January–May 2017. Altogether, nine thematic semi-structured interviews were conducted among private healthcare sector companies. The interviews were carried out in a discursive atmosphere, addressing the key themes identified from the literature concerning IC and BI tools. Thus, the interviews included discussion on specific issues, for example, what kinds of data sources are currently being utilised and whether the companies have enough organisational capabilities for BI utilisation.

Seventeen consultants were interviewed for the study. The approach was inductive, with semi-structured, thematic interviews. The interviewees from the consulting industry were management consultants and BI technology consultants; they were selected to be involved in the research based on their area of responsibility in BI-related consulting in their organisations. In total, 52 consultants were contacted via the professional social networking platform LinkedIn. The list of interviewees and their organisational positions and main responsibilities is presented in Table 2.

**Table 2:** List of interviewees, Organisational Positions, and Company Types

Interviewee	Position in the organisation	Type of consulting
1	Director	Technology
2	Consultant	Technology
3	Director	Technology
4	Consultant	Technology
5	Director	Technology

Interviewee	Position in the organisation	Type of consulting
6	Consultant	Technology
7	Director	Management consulting
8	Consultant	Technology
9	Manager	Management consulting
10	Manager	Management consulting
11	Manager	Management consulting
12	Manager	Technology
13	Director	Technology
14	Director	Technology
15	Director	Technology
16	Director	Management consulting
17	Consultant	Technology

The interviews were performed in April–October 2017. There were 12 interviews in the field of technology consulting and 5 interviews in management consulting. Altogether, 17 semi-structured thematic interviews were conducted among the consulting companies. The discursive interviews included discussions on issues like whether there were external data sources utilised in the customers’ organisations and customers’ organisations had enough capabilities for BI utilisation.

The interview data were transcribed and classified following the content analysis method, and the data were grouped by their key themes. In section 4.1, we present our results according to the interview themes. In section 4.3, we analyse the results using the modified value creation capabilities framework (Möller, Rajala and Svahn, 2005; Ratia and Myllärniemi, 2017), utilising it to point out the importance of IC in data-driven value creation in private health care.

## **4. Results and implications**

### **4.1 Utilisation of data in the private healthcare sector**

The private healthcare companies participating in this research utilised several data sources in their BI tool(s). Most had several data sources from operational and financial systems to be modelled in one data warehouse model and analysed further using one or several BI tools. In addition, most of the companies used more than one BI tool, from one to four BI tools each, for various – mainly historical – reasons (Ratia and Myllärniemi, 2017). Furthermore, digital channels were mentioned as one of the data sources. The multiple sources of structural capital included structured data being utilised in creating value. Utilisation of both internal and external data sources was considered crucial: As interviewee no. 2 stated, ‘Without a doubt, we have a need to combine various new data sources, not just our own internal operative data, but also external, open-source data, with the intention of doing deeper trend analysis. The aim is not only to serve our internal needs, from a production management point of view, but also to create new data for our customers – both corporations in general and individuals – regarding their personal health’. Thus, structural capital and combining data from both internal and external sources, as well as utilising open data, can be viewed as valuable assets. In addition, structural capital was viewed as a valuable factor for the future: ‘I strongly believe that it is becoming the centre of the business. Advanced data processing and its potential will open new business opportunities that were impossible before’ (interviewee no. 7). In addition, the core business was perceived to be moving more toward data-based business: ‘There will be new data-driven business concepts, around which the whole business will be built up’ (interviewee no. 7).

The second theme was related to the internal and external capabilities of the organisation. Internal and external capabilities and competences for data and BI tool utilisation have a significant role. All eight private healthcare organisations were using external capabilities to some extent. Some companies clearly had internal capabilities, and they were only utilising external capabilities in special cases. As interviewee no. 3 noted, 'We do the majority ourselves, but in special cases, we use consulting services – I would say about 10% of all the BI work'. Moreover, as another interviewee commented, 'We are trying to gain internal capabilities, but for deeper things we use consulting' (interviewee no. 9). However, there were also some organisations that outsourced some BI-related work on purpose: 'We have internal capabilities to some extent, but we have made a conscious decision to use consultants for some technical issues' (interviewee no. 4). Nevertheless, most of the companies exhibited a balance between internal and external capabilities, although many interviewees considered that the current internal capabilities were not as strong as they could have been. Some interviewees strongly felt that there must be a certain level of in-house capabilities to secure continuity. A lack of human capital is a relevant problem that is weakening the efficient utilisation of data: 'I don't have enough in-house capabilities right now, but such capabilities are on a recruiting list. This is slowing the progress and development of our BI' (interviewee no. 1). In addition, the creation of internal capabilities, or enhancing human capital, to enable efficient future data processing was considered important: 'If I think about future recruiting, and hiring more people, then one person is not going to be enough. Capabilities can become our bottleneck in terms of BI' (interviewee no. 5). Thus, having insufficient internal capabilities is slowing down the development and progress of BI.

#### **4.2 External data utilisation and organisational capabilities as a part of IC**

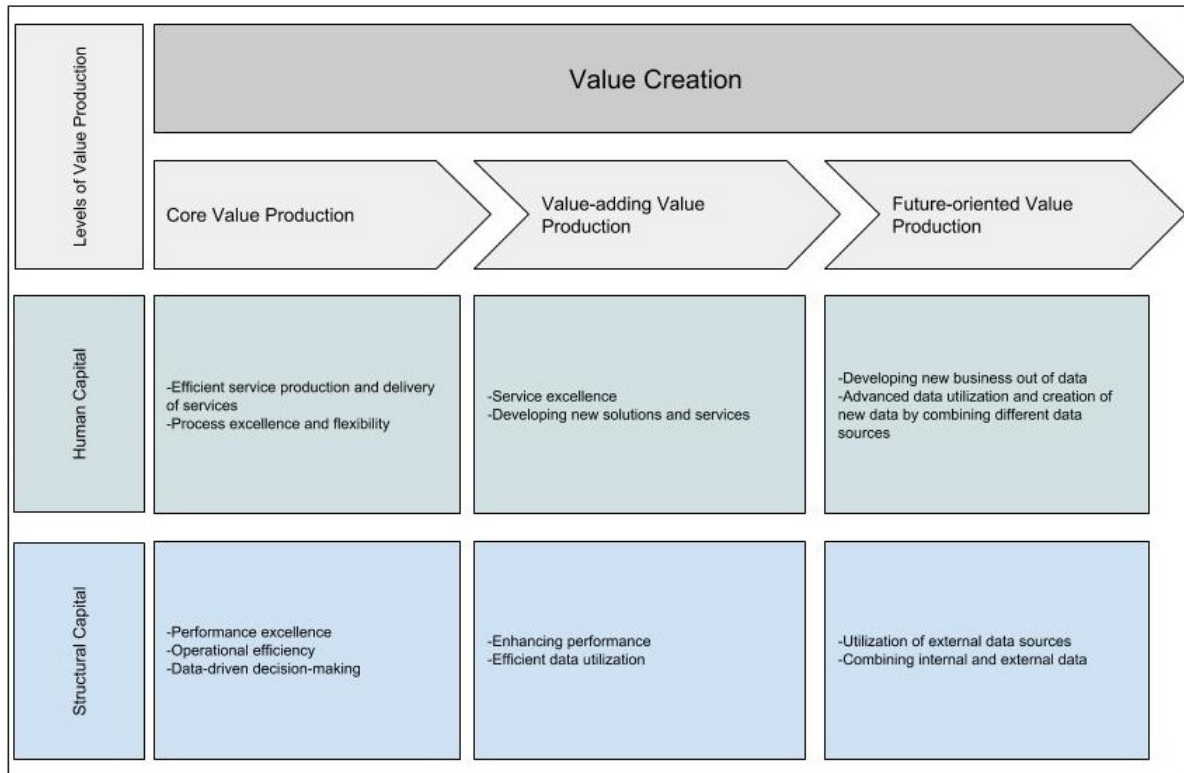
The interviewees from the consulting industry had opinions that meshed with those of private healthcare organisation decision makers, to the effect that external data sources were not being utilised enough. However, the potential was viewed as significant, and most BI tools allow combining internal data with open data or other forms of external data sources: 'This is going to grow, this is the direction we are heading' (interviewee no. 7). However, disagreement in the interviewees' opinions emerged in discussing whether the organisations were ready for utilising external data sources: As interviewee no. 4 argued, 'Even the internal data sources are not yet being utilised efficiently, not to mention external data sources'. Some of the interviewees had more faith in the monetisation of data: 'Linking it to the organisational data and process further on – This is actually something you want to pay money for!' (interviewee no. 16). The utilisation of external data sources is clearly growing; as one interviewee mentioned, 'No doubt we are going in this direction' (interviewee no. 12), and another stated, 'It is being done more and more' (interviewee no. 9). Nevertheless, although the awareness of possibilities concerning external data utilisation has grown significantly, it seems that it is still in its inception. The overall impression of most consultants was that, although some of the organisations are already doing this successfully, the others are just heading there.

The consultants also shared their opinions concerning capabilities. There were several views on the sufficiency of capabilities. Some of the interviewees strongly felt that there were not enough capabilities to fulfil developing organisations' needs: 'They use our services so much, and in such things, there is no way they would have enough capabilities of their own' (interviewee no. 11). As one interviewee argued, 'If they had internal competence in BI, they wouldn't be needing us so much' (interviewee no. 2). Another approach was that the controlling type of resources was sufficient, but there was a significant lack of resources on the data science and business sides: 'I can tell you where they lack competence, as we are always asked for data scientists and business strategists' (interviewee no. 16). In addition, one of the perspectives, especially on the management consulting side, was that the capability discussion is not only about operational capability, but also about the capabilities throughout the organisation, especially concerning the top management and strategic goals. However, it was obvious that the capability discussion is beyond the scope of operational performance; instead, it is part of the management strategy.

The discussion of future BI was strongly directed toward predictive analytics and evidence-based decision making. Historically, BI has been static and backward looking; now and for the future, it is becoming proactive and predicting. In addition, the processing is increasingly transferred from the ICT functions to the end user. In addition, one of the trends is the capacity to conduct predictive analytics. Online analytics enabling reactive interaction could enable evidence-based results in the decision making. Another future trend is collecting and combining external data sources to elucidate how the market functions.

### 4.3 IC enhancing value creation in the private healthcare sector in Finland

The three levels of value creation identified in the Finnish private healthcare sector are illustrated in Figure 1. IC dimensions, human capital and structural capital play a major role in the value production enabled by BI utilisation. The first level, core value production, requires human capital in efficient service production and delivery of services, as well as in process flexibility and excellence. In addition, structural capital affects performance excellence, operational efficiency and data-driven decision making. This value creation process requires both BI tools and data, as well as the capacity to use them properly.



**Figure 1:** Data-based value creation (based on Möller, Rajala and Svahn, 2005; Ratia and Myllärinemi, 2017).

The second level is moving toward value-adding value production. In the context of private healthcare, human capital can enhance service excellence and enable the development of new solutions and services. In contrast, structural capital enables enhancing performance and efficient data utilisation. Already, data sources create a potential in terms of value creation. In this research, most of the company representatives thought that the external data sources would turn into a competitive advantage in the near future. As the competition is increasing in the private healthcare sector in Finland, there is also pressure to provide better customer service and enhance customer satisfaction, as well as taking the data value-adding practices further. However, it is clear that IC dimensions, namely human and structural capital, play a major role in value creation.

The third and last level of value creation is highly future oriented. Here, human capital contributes to the development of new business from data and creates new data by combining different data sources. In addition, structural capital enhances and enables the utilisation of external sources, combining them with the organisational data to create value. In addition, when achieving this level of value, utilising machine learning and artificial intelligence was viewed as a potential part of structural capital. Creating value was also viewed as a goal, not only via the original business concept and utilising the existing data sources, but also from proactively seeking new opportunities to grow the business by utilising external data sources.

As a summary, value creation, utilising external data sources and capabilities in the private healthcare sector, can be considered multidimensional. Human capital and structural capital play a significant role in the value-creation process. By studying the value creation concept, we can identify the three levels of value creation from utilising different data sources (Möller, Rajala and Svahn, 2005; Ratia and Myllärinemi, 2017). The IC dimensions of human and structural capital are strongly involved in each level of value production.



## 5. Conclusions and discussion

This paper introduced a fairly novel, empirically focussed approach to discussing the role of IC in data-driven value creation in the Finnish private healthcare sector. The healthcare sector is changing rapidly and seeking new, better ways of improving performance; especially in the private sector, there is a clear need for better decision-making procedures (Ratia and Myllärniemi, 2017). It is essential to identify the factors affecting data-driven decision making. In addition, this paper illustrated the importance of different data source utilisations, especially combining internal and external data sources, along with their potential to create value. We analysed the value-creation factors through the concept model of value creation, seeking to achieve a better understanding of the key factors in each level of data-driven value production and the ability to identify the different dimensions of IC to create value (Möller, Rajala and Svahn, 2005; Myllärniemi and Helander, 2012). In addition, having private healthcare companies, as well as the consulting industry's perspective on the discussion of external data source utilisation and organisational capabilities, can help us to understand the role of IC dimensions in BI tool utilisation.

The research showed that, out of the IC dimensions, human capital and structural capital can have a significant role in data-driven value creation in private health care. However, existing organisational capabilities or competences in BI utilisation were considered insufficient for fulfilling organisational ambitions. Clearly, all the private healthcare companies were required to seek external capabilities or competences in BI utilisation to some extent. The requirements for external resources varied, from deep technological know-how to strategic approaches. In addition, it was clear that the need for capabilities will grow in the future. Structural capital can also be a valuable asset in terms of data-driven value creation. Nevertheless, utilisation of different data sources was seen as extremely important, now and in the future. After all, combining organisational data with external data can create new data, and thus, new business opportunities, which could turn into value. However, it is clear that the journey toward external data utilisation has begun, with some of the organisations being at the beginning of the journey and some already taking their second steps.

Based on the conducted research, some managerial implications can be drawn for private health care. First, external data combined with organisational data can potentially create new business concepts. Advanced utilisation of different data sources, internal and external, can enable the creation of new data and enhance organisational decision making. Second, focussing on the organisational capabilities or competence in BI tool utilisation can support data-driven value creation. Furthermore, human capital or capabilities are required not only in terms of BI-tool utilisation, but also on a strategic level, to improve data-driven decision making in the organisation. Third, the significance of external data utilisation will also grow in the future. Again, the potential of organisational value creation will be the driver for using more external data sources. In addition, the search for completely new business concepts and opportunities is an essential driver. However, IC dimensions can have a significant role in the development of data-driven decision making, as data have no value per se if there are no capabilities to use it. As there can be internal and external capabilities involved, knowledge sharing has a key role. There is a clear need to develop internal capabilities that enable BI tool utilisation and data-driven decision making. To some extent, external consultants can provide support to both. However, the development of capabilities can appear only when there is true knowledge sharing between the organisation and consultants, enabling the organisation to learn on a strategic and BI tool-utilisation level. Although some of the practical tasks and strategic development can be outsourced to external consultants, there must be a certain level of capabilities inside the organisation, especially in terms of data-driven decision making.

The practical outcome of this research will provide insight into the role of human capital and structural capital in data-driven value creation. In addition, it introduces a future-oriented data-driven approach that can create new business concepts for private healthcare companies. Sufficient capabilities or competence in BI tool utilisation, along with external data source utilisation, would increase the value creation ability among private healthcare sector companies. However, to uncover a deeper view on this issue, we need to gather more empirical data from private health care, at different organisational levels. Furthermore, it will be necessary to study the role of networks and relational capital in accessing different external data sources. In addition, we need to investigate the required capabilities of BI tool selection, so that we can point out specific tool requirements and functional features that are essential for the private healthcare sector, and we need to look at the consulting industry perspective for gaining a deeper understanding of data-driven value creation (Chen, Chiang and Storey, 2012; Brandão, et al., 2016; Ratia, et al., 2017).

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