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Maria Serena Chiucchi
Rosa Lombardi
Daniela Mancini *Editors*

Intellectual Capital, Smart Technologies and Digitalization

Emerging Issues and Opportunities



 Springer

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Editors

Maria Serena Chiucchi 
Department of Management
Università Politecnica delle Marche
Ancona, Italy

Rosa Lombardi 
Department of Law and Economics
of Productive Activities
Sapienza University of Rome
Rome, Italy

Daniela Mancini 
Faculty of Law
University of Teramo - Campus “Aurelio
Saliceti”
Teramo, Italy

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Preface

This volume is promoted by the Italian Association of Scholars in Accounting and Business Administration (SIDREA). It is the result of the joint studies conducted by the research group on Smart Technologies, Digitalization and Intellectual Capital (STEDIC). The SIDREA STEDIC research group is composed of more than one hundred scholars and was born in 2019 with the aims to diffuse and promote the culture of corporate intangibles, among which intellectual capital, smart technologies, and digitalization assume a prominent role. It was a long research journey, which was characterized by strong interaction among scholars and exchange of ideas, and, finally, after two years of study by the research group, this led to the results collected in this volume.

This edited book is directed to widely discover emerging issues in intellectual capital, smart technologies, and digitalization landscape. Particularly, this volume aims to investigate in depth all the nuances of the meaning and characteristics of intellectual capital, smart technologies, and digital processes, delving into their interactions and also defining new thrilling research paths and opportunities. In this scenario, the investigation of this multifaceted research topic intends to propose new insights both from a theoretical and from an empirical point of view to scholars, offering new evidence and advancing literature.

In recent years, the advent of the digital revolution has emphasized the relevance of the traditional intangible assets and has caused the insurgence of new corporate intangibles through which to achieve competitive advantages and foster value creation. Intangible assets need to be addressed in the perspective of intellectual capital (e.g., human capital, structural capital, and relational capital). Meanwhile, new intangibles follow innovative definitions focusing on smart technologies (e.g., artificial intelligence, Internet of things, blockchain, big data, and data analytics) and corporate digitalization processes and models.

Thus, the motivation for this volume is to fix corporate challenges related to the measurement and management of these traditional and new intangibles, in the current and future scenario. To this aim we have collected qualitative and

quantitative studies, theoretically based on the fields of business administration and accounting. Results of this edited book are based on several perspectives of analysis useful for a wide range of readers including the academic community.

Ancona, Italy
Rome, Italy
Teramo, Italy

Maria Serena Chiucchi
Rosa Lombardi
Daniela Mancini

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The Debate on IC, Smart Technologies, and Digitalization



Donatella Busso, Daniela Di Berardino, and Alberto Tonelli

1 Introduction

Intellectual Capital (IC) literature has developed over 20 years, attracting many scholars and generating several contaminations across business economics, accounting, and management studies. Recently, many literature reviews have been provided, with the aim of systematizing the main areas of IC literature, contributing to grasp the state of the art, and in identifying emerging research trends of specific IC clusters. Also relevant are the conceptual papers that aim to develop new frameworks to manage IC, both in private and in public domains, following multiple dimensions of value (economic, social, environmental) and multiple levels of analysis (firms, ecosystems, networks). These contributions reveal that the IC debate needs to refocus on new directions, attempting to explore new critical ways to interpret future issues in accounting and management fields derived by new technologies and new accounting information systems.

Big data, smart technologies, and digitalization have been extensively investigated in management and business studies. The intersection between digitization, smart technologies, and IC seems to be partially explored in the extant literature and mainly focused on strategic dimension. Recent studies explore the link between IC,

Di Berardino has developed paragraphs 2 and 3. Busso and Tonelli have developed paragraphs 4. Paragraphs 1 and 5 have involved all the authors.

D. Busso · A. Tonelli

Department of Management, University of Turin, Turin, Italy

e-mail: donatella.busso@unito.it; alberto.tonelli@unito.it

D. Di Berardino (✉)

Department of Business Administration and Management, University of Chieti-Pescara, Pescara, Italy

e-mail: daniela.diberardino@unich.it

technology, and sustainable development, IC and big data, analyzing both managerial implications and disclosure aspects.

This chapter provides an overview of the extant debate on IC literature, big data, smart technologies, and digitalization to highlight the emerging trends in business and management studies. Section 2 describes the main stages of IC research, the research findings, and the open questions; Section 3 introduces the possible intersection between IC and big data research; Section 4 provides a systematic literature review on big data, smart technologies, and digitalization applied to business and management topics.

2 The Evolution of Intellectual Capital Research

Understanding the IC research development is essential to systematize the contemporary debate around the new strategic drivers for the sustainable development of organizations, for managing efficiently the new technologies and providing comprehensive accounting information for stakeholders. As is well known, research on IC has gone through four stages of development and recently a fifth stage has been proposed, with the aim to revolutionize the scientific debate on IC by moving away from pre-established conceptual frameworks and traditional accounting models.

During the *first stage*, included between 1980s and 1990s, the aim was to find a common definition of the concept and a shared taxonomy for the components, following the hypothesis that IC is the main basis for value creation (Petty & Guthrie, 2000). A workable definition, coherent with the complexity theory of the system, unveils the *dynamic* nature of IC: it is a system of intangible resources combined thought processes and activities and embedded in the people (human capital), in the structure of a firm (structural capital), and in the firm's relationships (relational capital) with external stakeholders (Petrash, 1996).

Conversely, Stewart (1997, p. x) defines the IC as “the *sum* of everything everybody in a company knows that gives it a competitive edge [...] that can be put to create wealth,” emphasizing a property of linearity between the IC components (Bratianu, 2018).

Two main approaches of analysis flow from these definitions: static or external; dynamic or internal. The *static* view investigates the quality and quantity of IC resources, observing how they could be measured and visualized in a comprehensive reporting model. While the *dynamic* perspective investigates the IC in action, exploring how it could be managed and what are the intangible activities, the knowledge flows, and the internal processes that lead the strategy and the value creation (Cuganesan, 2005). The dynamic approach is closer to cognitivist perspective, to the resource-based view of the firm and the dynamic-capabilities theory; according to this perspective, IC does not exist in nature, but it emerges by the knowledge flows across people, processes, and relationships, so the same stock of resources might produce different ICs and different performance during the time (Giuliani, 2015; Kianto et al., 2020).

During the first and the *second stage*, the following theoretical assumptions have been used, jointly with other consolidated theories, to describe the relationship between the IC and the value, however, without the adequate empirical validation:

- (a) IC could justify the gap between market and book value of a company (Mouritsen et al., 2001). This theory provides a residual dimension of the value generated by IC, overlooking the value creation process and the relevant differences between the measurement methods of the market value. The anomalies in the financial market, the absence of a re-evaluation of IC components, and the limits of historical cost accounting for assets reduce the validity of this theory. Some authors, observing the high volatility of share price of public companies and the evaluation process in some M&A operations, identify the intellectual liabilities. They may reduce the value, arising from “weak strategic planning processes, dangerous work conditions, potential environmental clean-up, potential product tampering, [...] poor corporate reputation” (Harvey & Lusch, 1999). Few studies verify empirically this hypothesis (Caddy, 2002; Cuganesan, 2005; Stam, 2009; Giuliani, 2015), finding that the intellectual liabilities generate negative effects faster than the value creation process. The limited exploration of intellectual liabilities is a weakness. Intellectual liabilities could explain some failure in knowledge-intensive firms and they could explain the fragile relationship between IC, ethics and value (Gowthorpe, 2009).
- (b) Appropriate disclosure about IC improves investors’ decision-making, secures funding at a lower cost of capital, improving the profitability (Bismuth & Tojo, 2008), enhancing the competitive advantage (Bontis et al., 1999), and contributing to success and financial performance (Youndt et al., 2004). This theory, used extensively, has generated controversial findings discussed by Dumay (2012).

Following these theories, the evaluation methods of intangible assets and the reporting models became the focus of IC literature, generating a *second stage* of research between 1990 and 2010. This stage is the most productive and the most interdisciplinary and the Intellectual Capital Accounting (ICA) emerges. ICA is “a management, accounting and reporting technology towards understanding, measuring and reporting knowledge resources such as employee competencies, customer relationships, brands, financial relationships and information and communication technologies” (Guthrie et al., 2012, p. 70). ICA literature focuses greater attention on publicly listed companies, analyzing the content and the effects of IC disclosure in the capital market. Academics and practitioners develop a wide range of methods for measuring and reporting the IC at an organizational level. Many governments provide general Guidelines for IC reporting and the accounting standards referred to as intangibles are revised or approved (e.g., IFRS 3), to reduce the distance between ICA and financial accounting.

In the mid-2000s, IC research extended the focus on the public entities, nations, and non-profit organizations (NPOs) and, consequently, the concept of value changes. Many articles refer to the Higher Education system, covering issues both on IC reporting and on IC management (Leitner, 2004; Cañibano & Sánchez, 2009).

Few papers analyze hospitals (Habersam & Piber, 2003; Cavicchi & Vagnoni, 2017), national and local governments (Bontis, 2004; Dumay & Guthrie, 2007), cultural organizations (Donato, 2008), and third sector (Fletcher et al., 2003; Kong, 2003), observing issues related to management control, strategy, corporate governance, corporate reporting, and accountability. The intensive focus on *ostensive approach* leads the ICA literature toward the “*evaluatory trap*” (Humphrey et al., 2001; Dumay & Garanina, 2013): many papers, providing assumptions derived by documents not generated for the IC disclosure, generate new frameworks and measurement models, without a clear empirical evidence of their usefulness for the value creation process. Considering the heterogeneous information goals, several reports have been investigated during the time: the Sustainability Report, the Performance Plan for the public institutions, the Knowledge Balance-sheet for the universities, the Intellectual Capital Statements. Behind the meticulous representation of the indicators collected in these reports, the missing information is how organizations create value managing IC over time and a dilemma persists: high quantity of numbers may reduce the transparency and increase the risk to serve specific interests (Nielsen & Madsen, 2009).

A *third critical stage* begins since 2004 (Marr & Chatzkel, 2004; Mouritsen & Roslender, 2009), leading the scientific debate toward the managerial implications of IC across different organizations, promoting the integration of IC disclosure into corporate reporting and following a bottom-up approach, in order to develop a self-management of IC than the top-down imposition of this policy inside the organization (Dumay, 2016). Third stage places the debate on IC toward the integrated reporting <IR> research, maintaining a strict linkage with the second stage (Cuozzo et al., 2017). The <IR> research provides a new opportunity to explore the nature and the effects of IC in the value creation process and the interplay between intangible and tangible assets, considering that many intersections exist between the six capitals conceived in the <IR> and the three IC components (de Villiers & Sharma, 2020). Although the value concept evolves, including the ethical, social, and environmental impacts, the <IR-IC> research maintains the focus inside the organization boundaries, remaining anchored, predominantly, at financial dimension and sometimes to the first stage of IC research.

Gradually, the focus shifts on how IC could be developed on a wider scale (*fourth stage*), switching from a managerial to an ecosystem perspective (Dumay & Garanina, 2013), expanding the Bounfour’s thought (2005) about the transition from capitalist focus toward a community perspective. Some studies show that managing IC on a wider scale generates a positive impact in the local economy, enabling innovation, creating social capital (Borin & Donato, 2015) promoting societal and economic development (Secundo et al., 2017a). The levers of IC in action in private firms, public entities, NPOs, and in the ecosystem have been analyzed in detail in Guthrie et al. (2018), remarking the following: the implementation of IC involves many agents across and beyond the organizations; the value creation process is collective; nonfinancial indicators and the interventionist research approach are more appreciated to investigating the IC mobilized in the ecosystem, also exploring the sustainability issues.

The relationship between the IC and sustainability has received low attention and it has been focused on these research questions systematized in the literature review provided by Secundo et al. (2020): (a) understanding if and how the IC promote sustainability, analyzing both IC management and IC disclosure in private and in public sectors; (b) exploring the role of IC for the sustainable development of countries and communities. The concept of *Sustainable Intellectual Capital* emerges, to describe those intangible resources that affect the implementation of sustainable technologies, strategies, and processes (Lopez-Gamero et al., 2011). Research findings remark the relevance of these resources for the sustainable growth: organizational culture, human competences, technology innovation, and partnerships in the private and public sectors (Secundo et al., 2020; Cavicchi & Vagnoni, 2017); stakeholder's engagement, high level of education and technology innovation for the local development and the smart cities (Lopez-Ruiz et al., 2014; Matos et al., 2019). A wide range of these studies remains linked to the prior research question in IC literature: how IC could create value.

Recently, Dumay et al. (2018) and Harlow (2018) suggest the evolution of a potential *fifth stage*, refocusing the scientific debate on these issues: enhancing the critical perspective; verify whether managing IC is fruitful; expanding the IC boundaries, moving beyond the narrow definition of IC and providing a comprehensive vision of value across international settings.

3 IC and the Digital Revolution

The potential of new digital technologies, to bring societal and economic renewal and development, arises recently in IC debate. Literature attempts to explore new emerging trends, promoted by smart technologies evolution and Big Data paradigm (Secundo et al., 2017b). Digitalization and datafication of activities influence the structure of IC and the value creation process: technical skills, data capital, integrated information systems, cybersecurity, and organizational resilience became crucial; the organizations became more vulnerable, given the greater information dependency and the greater network exposition; many institutional and contingent variables may influence the knowledge flows, the utilization of information and the decision-making processes (Kianto et al., 2020). Consequently, IC measurement and IC management perspectives might consider these multiple relationships between organizations and networks or ecosystems, balancing quantitative with qualitative approaches.

Many papers provide theoretical frameworks to support strategic actors to detect processes and resources that could generate value for the organizations and their ecosystem, following the hypothesis that Big Data becomes the new critical assets of IC with high potential for value creation. If this assumption considers the data strategy an IC in action is not clear. Secundo et al. (2017b) suggest the following conceptual research paths: (a) analyzing how data capital impacts on IC components and which resources it creates; (b) verifying how Big Data might contribute to IC

strategy and value creation for the ecosystem; (c) exploring what is the value generating by the inclusion of Big Data in IC management; (d) analyzing who are the stakeholders involved in Data strategy connected to IC management. Other frameworks have been proposed in literature to connect IC and Big Data (De Santis & Presti, 2018; Uden & Del Vecchio, 2018), following this theoretical assumption: the value creation depends on how Big Data is managed and incorporated in IC practice. These considerations reproduce, in some way, the first IC stage issues, focusing the debate about the relevance of data capital for IC research. However, the possible inhibitors and risks (intellectual liabilities) related to extraction and analysis of Big Data, should be addressed before exploring the positive effect, integrating the IC debate with the future research trends in management and business studies.

4 Big Data, Smart Technologies, and Digitalization: The State of Art of Business and Management Studies

The objective of this section is to investigate how big data, smart technologies, and digitalization have been incorporated in business and management studies, starting from the definition of big data, smart technologies, and digitalization.

4.1 Definition

An incredible amount of data has been gaining ground so far (Fawcett & Waller, 2014; Surbakti et al., 2020), arising *Big Data (BD)* such a phenomenon that needs to be considered and managed despite its complexity. Indeed, widespread adoption and continuous improvement of technology are revolutionizing the way data is generated, collected, transmitted, and stored, contributing to such BD breakthroughs (Günther et al., 2017). Both academic and practitioner-oriented literatures are still trying to frame this phenomenon, but there is not a unique definition and a precise evaluation of BD at the moment (Gandomi & Haider, 2015; Surbakti et al., 2020).

The current literature defines BD through a growing list of characteristics, firstly starting from “Volume,” “Velocity,” and “Variety” identified (Laney, 2001). Then, two further features have been added, namely “Value” and “Veracity” (Yin & Kaynak, 2015). More recently, have been included “Variability” and “Visualization” as well (Mishra et al., 2017), referring to possible insights from data analysis.

A further classification of BD has been put in place according to (1) structured data with precise length and format, (2) semi-structured data, and (3) unstructured data that cannot be framed within a specific format or formula (Torrecilla & Romo, 2018).

Moreover, they are different from data usually adopted and generated for business uses (Arnaboldi et al., 2017) because they are often collected without a pre-defined purpose, promoting a bottom-up, inductive approach to their exploration (Constantiou & Kallinikos, 2015).

For what concerns *digitalization*, it can be defined as “the integration of the analogue and digital worlds with new technologies that enhance customer interaction, data availability and business processes” (Eling & Lehmann, 2018, p. 363). The integration of the “analog” and “digital worlds” with new technologies has already profoundly changed many sectors (Caputo et al., 2020; Simon, 2020; Öberg, 2020).

Smart technologies have been profoundly changing the way in conducting the organizations’ business. It is not possible to find a unique definition of smart technologies, but the application of smart technologies to different industries, services, and so on. Among such smart technologies, Artificial Intelligence (AI) and Blockchain are considered to be the most disruptive ones (Panetta, 2018; Carson et al., 2018).

4.2 Research Method

A systematic literature review (SLR) (Massaro et al., 2016) has been set up by the authors, which is a research method that exploits collection and analysis of data of previous research in order to draw what has been conducted so far in the field of business and management. In fact, since the topics under-analysis have been gaining ground during the last two decades, and especially in the last 10 years, the authors, through this research, have decided to identify the state-of-the-art of them by collecting and analyzing the scholarly literature referred to “big data,” “smart technologies,” and “digitalization.”

The selected database is Web of Science (WoS), which offers updated documents, covers archived records starting in 1900, and evaluates the importance and the influence of specific publications (Falagas et al., 2008).

In order to draw the lines of the research, it has been conducted a pilot test with the aim of identifying the most suitable keywords. The result of the research query string is as follows:

TOPIC: (“Big Data”) OR TOPIC: (“Digitalization”) OR TOPIC: (“Smart Technolog*”).

The first search has been conducted in November 2020 and considering only the WoS categories: *Management*, *Business*, and *Business Finance*, the screening has got 5246 articles, namely 2707 for Management, 2110 for Business, and 429 for Business Finance.

In order to consider only the latest conducted research, it has been covered as timespan, a narrow period, namely, years from 2001 to 2020, getting 4225 articles.

Moreover, in proceeding with a more in-depth analysis, the authors only selected articles published in appertaining journals classified in 2019 ranking—Top

20 journals SCImago published from the following fields: “*business, management and accounting*,” “*accounting*,” “*business and international management*” and “*finance*.”

This led to 241 articles and, after reading each article’s abstract, the authors have eliminated the ones that were not related to the core issue. During this process, 162 articles have been removed to ensure substantive alignment with study’s core topic while the other 5 articles have not been considered due to their unavailability; this resulted in 74 academic articles (included in Table 1).

Table 2 shows the screening process used.

Tightening the focus only on the 74 selected papers by further splitting the articles by the years, 61.84% of the papers refer to 2019–2020 and almost 91% to the timespan 2015–2020 as shown in Table 3.

4.3 Results

The closely related articles have been split into different categories according to their related topics, as shown in Table 4.

As shown in Table 4 some papers refer to more than one topic. However, it clearly emerges that big data is the most frequent topic examined since more than half of the selected papers refer to big data alone or together with smart technology.

Further analysis has been conducted by the authors: all the articles have been classified more in-depth, considering the following category: finance, innovation, management, marketing, and others in order to understand which field was more investigated. We used the category “finance” for papers referring to banks and financial markets and category “innovation” when the paper was focused on the innovation process. “Management” is the broad category and includes a variety of papers about, among the others, analysis on supply chain, entrepreneurship, business model, organization. Under the category “marketing” we classified all the papers referring to the relationship between the company and the customers, varying from the service personalization to digital advertising. Some papers were not classifiable within one of the above categories and so they were included in a residual category (“other”).

Findings clearly highlight that almost half of the papers refer to the category “management” and this is a logical consequence due to its broad content. Eleven papers are specifically dedicated to the supply chain of which 10 investigated the impact on big data and smart technologies affect the supply chain. Six papers are in the same way linked to the impact of big data, digitalization, and smart technologies on companies’ business models. Five papers are in the field of entrepreneurship: 2 of them tried to understand how to use big data and smart technologies in evolving research about entrepreneurship. Five papers are about online platforms and how they can change the way “bricks and mortars” companies can move to digital platforms. International business is another topic investigated (4 papers) as well as

Table 1 Academic articles analyzed

Article	Category	Topic
Aguinis, H; Cascio, WF; Ramani, RS, (2017), Science's reproducibility and replicability crisis: International business is not immune, <i>Journal Of International Business Studies</i> , Vol. 48, pages 653–663	Other	Other
Aguinis, H; Ramani, RS; Cascio, WF, (2020), Methodological practices in international business research: An after-action review of challenges and solutions, <i>Journal Of International Business Studies</i> , Volume 51, pages 1593–1608	Management	International Business
Araujo, T; Copulsky, JR; Hayes, JL; Kim, SJ; Srivastava, J, (2020), From Purchasing Exposure to Fostering Engagement: Brand-Consumer Experiences in the Emerging Computational Advertising Landscape, <i>Journal Of Advertising</i> , Vol. 49, Issue 4, Pages 428–445	Marketing	Advertising
Balog, K, (2020), The concept and competitiveness of agile organization in the fourth industrial revolution's drift, <i>Strategic Management</i> , Vol. 25, No. 3	Management	Organization
Banalieva, ER; Dhanaraj, C, (2019), Internalization theory for the digital economy, <i>Journal Of International Business Studies</i> , Vol. 50, pages 1372–1387	Management	International Business
Begenau, J, Farboodi, M, Veldkamp, L, (2018), Big data in finance and the growth of large firms, <i>Journal Of Monetary Economics</i> , vol. 97(C), pages 71–87	Finance	Cost of financing
Belk, RW (2017), Qualitative Research in Advertising, <i>Journal Of Advertising</i> , vol. 46, pages 36–47	Marketing	Advertising
Benoit, S, Klose, S, Wirtz, J, Andreassen, TW, Keiningham, TL, (2019), Bridging the data divide between practitioners and academics Approaches to collaborating better to leverage each other's resources <i>Journal Of Service Management</i> , Vol. 30 No. 5, pp. 524–548	Management	Data divide
Beverungen, D, Kundisch, D, Wunderlich, N, (2020), Transforming into a platform provider: strategic options for industrial smart service providers, <i>Journal Of Service Management</i> , DOI: 10.1108/JOSM-03-2020-0066	Management	Online Platforms
Bourreau, M, Gensollen, M, Moreau, F, (2012), The Impact of a Radical Innovation on Business Models: Incremental Adjustments or Big Bang?, <i>Industry And Innovation</i> , vol. 19, issue 5, pages 415–435	Management	Business Model
Breidbach, CF, Maglio, P, (2020), Accountable algorithms? The ethical implications of data-driven business models, <i>Journal Of Service Management</i> , DOI: 10.1108/JOSM-03-2019-0073	Management	Business Model

(continued)

Table 1 (continued)

Article	Category	Topic
Buhalis, D; Harwood, T; Bogicevic, V; Viglia, G; Beldona, S; Hofacker, C, (2019), Technological disruptions in services: lessons from tourism and hospitality, <i>Journal Of Service Management</i> , Vol. 30 No. 4, pp. 484–506	Management	Business Model
Cassetta, E, Monarca, U, Dileo, I, Di Berardino, C, Pini, M, (2020), The relationship between digital technologies and internationalisation. Evidence from Italian SMEs, <i>Industry And Innovation</i> , vol. 27, issue 4, pages 311–339	Management	International Business
Chen, G, Xie, PH, Dong, J, Wang, TF, (2019), Understanding Programmatic Creative: The Role of AI, <i>Journal Of Advertising</i> , vol 48, issue 4, pages 347–355	Marketing	Advertising
Coad, A; Srhoj, S, (2020), Catching Gazelles with a Lasso: Big data techniques for the prediction of high-growth firms, <i>Small Business Economics</i> , Vol. 55, pages 541–565	Other	Other
Cong, LW, He, ZG, (2019), Blockchain Disruption and Smart Contracts, <i>Review Of Financial Studies</i>	Other	Other
De Keyser, A, Kocher, S, Alkire, L, Verbeeck, C, Kandampully, J, (2019), Frontline Service Technology infusion: conceptual archetypes and future research directions, <i>Journal Of Service Management</i> , Volume 32, Issue 5, Pages 1754–1797	Management	Organization
Durach, CF, Blesik, T, von Doring, M, Bick, M, (2020), Blockchain Applications in Supply Chain Transactions, <i>Journal Of Business Logistics</i> , https://doi.org/10.1111/jbl.12238	Management	Supply Chain
Fawcett, SE, Waller, MA, (2014a), Supply Chain Game Changers-Mega, Nano, and Virtual Trends-And Forces That Impede Supply Chain Design (i.e., Building a Winning Team), <i>Journal Of Business Logistics</i> , vol. 35, issue 3, pages 157–164	Management	Supply Chain
Fawcett, SE, Waller, MA, (2014b), Can We Stay Ahead of the Obsolescence Curve? On Inflection Points, Proactive Preemption, and the Future of Supply Chain Management, <i>Journal Of Business Logistics</i> , Vol. 35 No. 1, 2014	Management	Supply Chain
Ferrer-Serrano, M, Latorre-Martinez, MP, Fuentelsaz, L, (2020), The European research landscape under the Horizon 2020 Lenses: the interaction between science centers, public institutions, and industry, <i>Journal Of Technology Transfer</i> , https://doi.org/10.1007/s10961-020-09816-3	Innovation	Innovation
Fosic, I; Trusic, A; Sebalj, D, (2017), Digital Organizational Strategy - Ticket for Competitiveness on the International Market, <i>Strategic Management</i> , Vol. 23, No. 3	Other	Other

(continued)

Table 1 (continued)

Article	Category	Topic
Goncalves, L, Patricio, L, Teixeira, JG, Wunderlich, NV, (2020), Understanding the customer experience with smart services, <i>Journal Of Service Management</i> , Vol. 31 No. 4, pp. 723–744	Marketing	Customers' experience
Gordon, BR, Zettelmeyer, F, Bhargava, N, Chapsky, D, (2019), A Comparison of Approaches o Advertising Measurement: Evidence from Big Field Experiments at Facebook, <i>Marketing Science</i> , Volume 38, Issue 2, Pages 193–364	Marketing	Advertising
Griffith, DA; Chen, QM, (2004) The influence of virtual direct experience (VDE) on on-line ad message effectiveness, <i>Journal Of Advertising</i> , Vol. 33, Issue 1, Pages 55–68	Marketing	Customers' experience
Gupta, S, Leszkiewicz, A, Kumar, V, Bijmolt, T, Potapov, D, (2020), Digital Analytics: Modeling for Insights and New Methods, <i>Journal Of Interactive Marketing</i> , Volume 51, Pages 26–43	Marketing	Marketing strategies
Hamister, JW, Magazine, MJ, Polak, GG, (2018), Integrating Analytics Through the Big Data Information Chain: A Case From Supply Chain Management, <i>Journal Of Business Logistics</i> , Volume39, Issue3, Pages 220–230	Management	Supply Chain
Hazee, S, Zwienenberg, TJ, Van Vaerenbergh, Y, Faseur, T, Vandenberghe, A, Keutgens, O, (2020), Why customers and peer service providers do not participate in collaborative consumption, <i>Journal Of Service Management</i> , Vol. 31 No. 3, pp. 397–419	Management	Business Model
Herhausen, D, Emrich, O, Grewal, D, Kipfelsberger, P, Schoegel, M, (2020), Face Forward: How Employees' Digital Presence on Service Websites Affects Customer Perceptions of Website and Employee Service Quality, <i>Journal Of Marketing Research</i> , Vol. 57, Issue 5	Marketing	Customers' experience
Hornuf, L, Klus, MF, Lohwasser, TS, Schwenbacher, A, (2020), How do banks interact with fintech startups? <i>Small Business Economics</i> , https://doi.org/10.1007/s11187-020-00359-3	Finance	Fintech
Ilyes, C, Szekeres, B, (2017), The Impact of the Digital Economy on Controlling, <i>Strategic Management</i> , vol. 22, issue 3, pages 44–51	Management	Business Model
Kabadayi, S; Ali, F; Choi, H; Joosten, H; Lu, C, (2019), Smart service experience in hospitality and tourism services A conceptualization and future research agenda, <i>Journal Of Service Management</i> , Vol. 30 No. 3, pp. 326–348	Marketing	Personalized services
Karolyi, GA; Van Nieuwerburgh, S, (2020), New Methods for the Cross-Section of Returns, <i>Review Of Financial Studies</i> , Volume 33, Issue 5, Pages 1879–1890)	Finance	Asset price

(continued)

Table 1 (continued)

Article	Category	Topic
Kellogg, KC, Valentine, MA, Christin, A (2020), Algorithms At Work: The New Contested Terrain Of Control Academy Of Management Annals, Vol. 14, No. 1	Management	Organization
Kenney, M; Rouvinen, P; Seppala, T; Zysman, J, (2019), Platforms and industrial change, Industry And Innovation, Vo. 26, Issue 8, Pages 871–879	Management	Online Platforms
Kher, R, Terjesen, S, Liu, C, (2020), Blockchain, Bitcoin, and ICOs: a review and research agenda, Small Business Economics, https://doi.org/10.1007/s11187-019-00286-y	Other	Other
Kostin, KB, (2018), Foresight of the Global Digital Trends, Strategic Management, Vol. 23, Issue 2, Pages 11–19	Management	International Business
Krafft, M, Sajtos, L, Haenlein, M, (2020), Challenges and Opportunities for Marketing Scholars in Times of the Fourth Industrial Revolution, Journal Of Interactive Marketing, Volume 51, Pages 1–8	Marketing	Impact of marketing on research and scholars
Kunz, WH, Walsh, G, (2020) After the revolution – new chances for service research in a digital world, Journal Of Service Management, Vol. 31, No. 3, pp. 597–607	Marketing	Impact of marketing on research and scholars
Liebrechts, W, Darnihamedani, P, Postma, E, Atzmueller, M, (2020), The promise of social signal processing for research on decision-making in entrepreneurial contexts, Small Business Economics, Vol. 55, pages 589–605	Management	Entrepreneurship
Lim, C, Kim, MJ, Kim, KH, Kim, KJ, Maglio, P, (2019), Customer process management A framework for using customer-related data to create customer value, Journal Of Service Management, Vol. 30 No. 1, pp. 105–131	Marketing	Personalized services
Liu, X, Burns, AC, Hou, YJ, (2017), An Investigation of Brand-Related User-Generated Content on Twitter, Journal Of Advertising, Volume 46, Issue 2, Pages 236–247	Marketing	Advertising
Malhouse, EC, Buoye, A, Line, N, El-Manstrly, D, Dogru, T, Kandampully, J, (2019), Beyond reciprocal: the role of platforms in diffusing data value across multiple stakeholders, Journal Of Service Management, Vol. 30 No. 4, pp. 507–518	Management	Online Platforms
Malhouse, EC, Haenlein, M, Skiera, B, Wege, E, Zhang, M, (2013), Managing Customer Relationships in the Social Media Era: Introducing the Social CRM House, Journal Of Interactive Marketing, Volume 27, Issue 4, Pages 270–280	Marketing	Customers' experience
Malhouse, EC, Li, HR, (2017), Opportunities for and Pitfalls of Using Big Data in Advertising Research, Journal Of Advertising, Volume 46, Issue 2, Pages 227–235	Marketing	Advertising

(continued)

Table 1 (continued)

Article	Category	Topic
Mazzucato, M, (2016), From market fixing to market-creating: a new framework for innovation policy, <i>Industry And Innovation</i> , Volume 23, Issue 2, Pages 140–156	Innovation	Innovation
Miller, JW, Ganster, DC, Griffis, SE, (2018), Leveraging Big Data to Develop Supply Chain Management Theory: The Case of PanelData, <i>Journal Of Business Logistics</i> , Volume 39, Issue 3, September 2018, Pages 182–202	Management	Supply Chain
Nair, HS; Misra, S; Hornbuckle, WJ; Mishra, R; Acharya, (2017), A Big Data and Marketing Analytics in Gaming: Combining Empirical Models and Field Experimentation, <i>Marketing Science</i> , Volume 36, Issue 5, Pages 645–812	Marketing	Customers' experience
Obschonka, M, Audretsch, DB, (2020), Artificial intelligence and big data in entrepreneurship: a new era has begun, <i>Small Business Economics</i> , Volume 55, pages 529–539	Management	Entrepreneurship
Obschonka, M, Lee, N, Rodriguez-Pose, A, Eichstaedt, JC, Ebert, T, (2020), Big data methods, social media, and the psychology of entrepreneurial regions: capturing cross-county personality traits and their impact on entrepreneurship in the USA, <i>Small Business Economics</i> , DOI: 10.1007/s11187-019-00204-2	Management	Entrepreneurship
Ojala, A, Evers, N, Rialp, A, (2018), Extending the international new venture phenomenon to digital platform providers: A longitudinal case study, <i>Journal Of World Business</i> , Volume 53, Issue 5, Pages 725–739	Management	Online Platforms
Ordenes, FV, Ludwig, S, De Ruyter, K, Grewal, D, Wetzels, M, (2017), Unveiling What Is Written in the Stars: Analyzing Explicit, Implicit, and Discourse Patterns of Sentiment in Social Media, <i>Journal Of Consumer Research</i> , Volume 43, Issue 6, Pages 875–894	Marketing	Customers' experience
Prufer, J, Prufer, P, (2020), Data science for entrepreneurship research: studying demand dynamics for entrepreneurial skills in the Netherlands, <i>Small Business Economics</i> , Volume 55, pages 651–672	Management	Entrepreneurship
Rao, S, Ellis, SC, Goldsby, TJ, Raju, D, (2019), On the Invisible Inventory Conundrum in RFID-Equipped Supply Chains: A Data Science Approach to Assessing Tag Performance, <i>Journal Of Business Logistics</i> , Volume 40, Issue 4, Pages 339–358	Management	Supply Chain
Routledge, BR, (2018), Comments on: Big data in finance and the growth of large firms, by Juliane Begenau & Maryam Farboodi & Laura Veldkamp, <i>Journal Of Monetary Economics</i> , Volume 97, Pages 88–90	Finance	Cost of financing

(continued)

Table 1 (continued)

Article	Category	Topic
Roy, A; Huh, J; Pfeuffer, A; Srivastava, J, (2017), Development of Trust Scores in Social Media (TSM) Algorithm and Application to Advertising Practice and Research, <i>Journal Of Advertising</i> , Vol. 46, Issue 2, Pages 269–282	Marketing	Advertising
Sanders, NR, Boone, T, Ganeshan, R, Wood, JD, (2019), Sustainable Supply Chains in the Age of AI and Digitization: Research Challenges and Opportunities, <i>Journal Of Business Logistics</i> , Volume 40, Issue 3, September 2019, Pages 229–240	Management	Supply Chain
Schoenherr, T, Speier-Pero, C, (2015), Data Science, Predictive Analytics, and Big Data in Supply Chain Management: Current State and Future Potential, <i>Journal Of Business Logistics</i> , Volume 36, Issue 1, Pages 120–132	Management	Supply Chain
Slavic, A; Bjekic, R; Berber, N, (2017), The Role of the Internet and Social Networks in Recruitment and Selection Process, <i>Strategic Management</i> , 2017, Vol. 22, No. 3, Pages 36–43	Other	Other
Smyth, KB, Croxton, KL, Franklin, R, Knemeyer, AM, (2018), Thirsty in an Ocean of Data? Pitfalls and Practical Strategies When Partnering With Industry on Big Data Supply Chain Research, <i>Journal Of Business Logistics</i> , Volume 39, Issue 3, Pages 203–219	Management	Supply Chain
Stein, MK; Wagner, EL; Tierney, P; Newell, S; Galliers, RD, (2019), Datification and the Pursuit of Meaningfulness in Work, <i>Journal Of Management Studies</i> , Volume 56, Issue 3, Pages 685–717	Other	Other
Steinberg, E, (2020), Big Data and Personalized Pricing, <i>Business Ethics Quarterly</i> , Volume 30, Issue 1, pp. 97–117	Marketing	Personalized prices
Thakor, AV, (2020), Fintech and banking: What do we know?, <i>Journal Of Financial Intermediation</i> , Vol. 41	Finance	Fintech
Vives, X, (2019), Digital Disruption in Banking, <i>Annual Review Of Financial Economics</i> , Vol. 11, pages 243–272	Finance	Fintech
Vojvodic, K, (2019), Brick-and-Mortar Retailers: Becoming Smarter with Innovative Technologies, <i>Strategic Management</i> , Vol. 24, No. 2, pp. 003–011	Management	Business Model
Von Bloh, J, Broekel, T, Ozgun, B, Sternberg, R, (2020), New(s) data for entrepreneurship research? An innovative approach to use Big Data on media coverage, <i>Small Business Economics</i> , vol. 55(3), pages 673–694	Management	Entrepreneurship
Waller, MA, Fawcett, SE, (2013b), Data Science, Predictive Analytics, and Big Data: A Revolution That Will Transform Supply Chain Design and Management, <i>Journal Of Business Logistics</i> , Volume 34, Issue 2, Pages 77–84	Management	Supply Chain

(continued)

Table 1 (continued)

Article	Category	Topic
Waller, MA; Fawcett, SE, (2013a), Click Here for a Data Scientist: Big Data, Predictive Analytics, and Theory Development in the Era of a Maker Movement Supply Chain, <i>Journal Of Business Logistics</i> , Volume 34, Issue 4, Pages 249–252	Management	Supply Chain
Wedel, M, Kannan, PK, (2016), Marketing Analytics for Data-Rich Environments, <i>Journal Of Marketing</i> , Vol 80, Issue 6	Marketing	Impact of marketing on research and scholars
Wirtz, J, Patterson, PG, Kunz, WH, Gruber, T, Lu, VN, Paluch, S, Martins, A, (2018), Brave new world: service robots in the frontline, <i>Journal Of Service Management</i> , Vol. 29 No. 5, pp. 907–931	Innovation	Innovation
Yoon, G, Li, C, Ji, Y, North, M, Hong, C, Liu, JM, (2018), Attracting Comments: Digital Engagement Metrics on Facebook and Financial Performance, <i>Journal Of Advertising</i> , Volume 47, Issue 1, pages 24–37	Marketing	Advertising
Zhang, LL, Chung, DJ, (2020), Price Bargaining and Competition in Online Platforms: An Empirical Analysis of the Daily Deal Market, Volume 39, Issue 4, Pages 669–848	Management	Online Platforms
Zhong, N, Schweidel, DA, (2020), Capturing Changes in Social Media Content: A Multiple Latent Changepoint Topic Model, <i>Marketing Science</i> , Volume 39, Issue 4, Pages 669–848	Marketing	Social media metrics
Zhu, C, (2020), Big Data as a Governance Mechanism, <i>Review Of Financial Studies</i> , Volume 32, Issue 5, Pages 2021–2061	Finance	Asset price

Table 2 Journal screening

Search strategy	No. of papers
Query string of keywords	
TOPIC: ("Big Data") OR TOPIC: ("Digitalization") OR TOPIC: ("Smart Technolog*")	68,252
Refined by: WoS categories—"Management," "Business," and "Business finance"	5404
Refined by: timespan 2001–2020	4225
Refined by: Top 20 Journals—2019 SCImago ranking (fields: "business, management and accounting," "accounting" and "business and international management" and "finance")	241
Refined by: Abstract screening manually conducted by the researchers	74

Source: Authors' elaboration

Table 3 74 selected papers by year

Year	# paper	%	Cumulative frequencies (%)
2020	28	37.84	37.84
2019	17	22.97	60.81
2018	10	13.51	74.32
2017	9	12.16	86.49
2016	2	2.70	89.19
2015	1	1.35	90.54
2014	2	2.70	93.24
2013	3	4.05	97.30
2012	1	1.35	98.65
2011	0	0.00	98.65
2010	0	0.00	98.65
2009	0	0.00	98.65
2008	0	0.00	98.65
2007	0	0.00	98.65
2006	0	0.00	98.65
2005	0	0.00	98.65
2004	1	1.35	100.00
2003	0	0.00	100.00
2002	0	0.00	100.00
2001	0	0.00	100.00
Total	74	100.00	100.0

Source: Authors' elaboration

Table 4 Investigated research's topics

Topic	# papers	%
Big data	35	47.30
Digitalization and smart technology	10	13.51
Smart technology	14	18.92
Big data and smart technology	4	5.41
Digitalization	11	14.86
Total	74	100.00

Source: Authors' elaboration

organization (3 papers). One paper is a proposal on how academics and managers could collaborate in order to reduce the data divide.

The second most investigated category is marketing. Smart technologies and digitalization have affected companies' marketing strategies: 8 papers are dedicated to change in advertising whereas 6 have investigated customers' experience and how it has been changed due to new technologies. Big data and smart technologies allow companies to personalize services and price: 2 papers are dedicated to how to personalize services whereas 1 paper is dedicated to use big data to personalize price and another paper to social media metrics. Digitalization can be used also to

obtain insights from customers and obtain information to be used in marketing strategies, whereas 3 papers explore the impact on research and scholars.

Finance counts 7 papers of which 3 dedicated to fintech and their relationship with incumbents. The big amount of data and the smart technologies allow new analysis about asset price: 2 papers are dedicated to this topic. Other 2 papers are dedicated to big data, their use by large companies and firms' cost of financing.

Three papers are specifically dedicated to innovation, whereas 7 papers cover different topics (human resources, application of blockchain in different fields, use of digital technologies in different countries).

In conclusion, big data, smart technologies, and digitalization have become a hot topic in the last 2 years, in particular in the management and marketing fields. These topics are fundamental for companies and regulators in the next few years because of their importance for competitiveness of both firms and countries. There is room for scholars to explore the countless consequences of big data, smart technologies, and digitalization in management, business, finance, and accounting.

5 Conclusions

The debate on IC shifts toward the main challenges of firms: digital revolution; sustainability; integration of processes, management approaches, and reporting models. Although the digital revolution seems to confirm the strategic role of human competences, technologies, know-how, and relationships, few papers investigate how IC contributes to exploit the potential of digital revolution and how firms disclose their digital capital in the reporting model.

Literature review shows that in business and management studies the digital revolution has been widely explored in marketing and strategy studies, while few papers deal with the accounting implications and the enterprise risk management. Future research could explore deeply the followings issues: (a) how digitalization, smart technologies, and BD impact on IC components or generate new strategic resources, following an integrated managerial approach; (b) how these technologies and these processes might contribute to value creation for the ecosystem; (c) how this phenomenon changes the corporate disclosure, integrating the tangible, financial, and intangible nature of resources and processes.

Considering the high economic impact of digital companies and the increasing datafication of business models, the traditional financial accounting requests new models to visualize, measure, and interpret the impact of the intangible resources, especially those related to smart technologies and datafication of processes. To emancipate the ICA, bridging the gap between information and knowledge, the contemporary accounting needs more descriptions and narrative than measures (Rooney & Dumay, 2016), more critical, sociological, and ethical debate over the accounting technique and no boundaries, as suggested for the progress of IC research.

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