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Saeudy, M., Gerged, A.M. orcid.org/0000-0001-6805-2737 and Albitar, K. (2022) Accounting perspectives on the business value of big data during and beyond the COVID-19 pandemic. *Journal of Accounting and Management Information Systems*, 21 (2). pp. 174-199. ISSN 1583-4387

<https://doi.org/10.24818/jamis.2022.02002>

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Accounting perspectives on the business value of big data during and beyond the COVID-19 pandemic

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ABSTRACT

Research Question: How can business organizations develop accounting practices to use big data to create competitive intelligence advantages to survive during and beyond the COVID-19 conditions?

Motivation: We aim to provide new accounting perspectives for using big data techniques in business organizations beyond the COVID-19.

Idea: We argue that the massive reduction in business capacity and operations will interpose the accounting and financial practices beyond the COVID-19 pandemic. There is a crucial need to uncover the underlying business practices and market circumstances toward the radical shifts in business and society.

Data: Our paper uses a desk study method to investigate companies' possible challenges and opportunities to use big data analytics as a survival method during and beyond the COVID-19 conditions.

Tools: Critical contingencies represent one of the leading business strategies to manage the shift in customer demand and business risks. Big data can be used in this sense as a valuable intangible asset to create these critical contingencies and help a business survive beyond this pandemic.

Findings: This study provides policy and practitioner implications in relation to establishing new accounting perspectives on big data analytics in the context of achieving economic sustainability for corporations during and beyond the COVID-19 pandemic. It offers new

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forms of trust, accountability and governance practices to integrate big data into accounting practices to create more competitive intelligence for businesses.

Contribution: This study extends previous accounting literature by offering unique insights and critical developmental thoughts about accounting perspectives of big data applications, opportunities and challenges beyond the COVID-19 pandemic. It provides a critical understanding of the predictive analytics of big data from an accounting perspective as an intangible asset

Keywords: *Big Data Analytics, Big Data Risks, Big data Governance, COVID-19 Pandemic, Accounting Practices.*

JEL codes: M41

1. Introduction

The COVID-19 and world lockdown conditions imposed a huge reply upon using the online services. Business data was generated from different levels of sources and techniques. The data handling techniques are changing due to the unique characteristics to deal with terabytes, petabytes, and now even zettabytes (Panneerselvam *et al.*, 2015). Incorporating corporate data into data analytics and big data will affect the accounting profession in the short and long term (Vasarhelyi *et al.*, 2015). Big data are essential for many business organizations (Mesa, 2019) to obtain deeper insights into stakeholders, especially in virtual business organizations, online platforms, social media (Arnaboldi *et al.*, 2017), national health authorities, and governments (Janvrin & Watson, 2017). Business organizations produce many forms of structured and unstructured data that could not be managed by traditional data management tools to support the decision-making process. It requires data analytic software (Janvrin & Watson, 2017) to help business organizations to build competitive intelligence to analyze and gain valuable insights linked to decision-making processes (Ranjan & Foropon, Big Data Analytics in Building the Competitive Intelligence of Organizations, 2021). The production and utilization of big data raise critical areas for organizations, regulators, and citizens in supporting decision-making processes (Zarsky, 2016). The relationships between big data and advanced technologies have become stronger (Hintze *et al.*, 2017). Large data sets now stand at ten zettabytes (10 billion terabytes) and double every two years. Consequently, the production and utilization of big data raise important ethical and accountability challenges for many business organizations. At the same time, the adequacies of accounting tools and practices were not enough to ensure the efficiency, security, privacy of all users and big data brokers (Dillard & Vinnari, 2017).

There is a lack of academic research on using big data in accounting and supporting business organizations (Fiorini *et al.*, 2018). In addition, big data is a fragmented

emerging domain of research theoretically and empirically (Frizzo-Barker *et al.*, 2016). This research is trying to fill this gap and propose an accounting framework to consider big data as an intangible asset to support businesses to survive during and beyond the COVID-19 conditions. Therefore, this research paper contributes to the academic and professional knowledge of how accounting practices could be developed to manage big data in the following areas. First, we develop a critical understanding of the predictive analytics of big data from an accounting perspective as an intangible asset. Second, our study explores the new forms of trust, accountability and governance practices of integrating big data in accounting practices to create competitive intelligence to survive during and beyond the COVID-19 pandemic. Third, we aim at exploring the forms of governance and competitive intelligence of using big data in developing accounting practices. Finally, we develop a coherent analysis for an accounting framework to use big data as an intangible asset to support the sustainability of businesses during and beyond the COVID-19 pandemic.

Two main reasons justify the urgent need for this research. First, the UK government extended the furlough scheme by £4.6 Billion to support businesses and self-employed people during the pandemic (The UK HM Treasury, 2021). It involves some pressures on big data collectors and brokers to use and/or misuse big data to create more business opportunities. According to initial results from the business impact of Coronavirus (COVID-19) survey, over 1 in 10 (12%) currently trading UK businesses said that turnover had decreased by more than 50% compared with what is normally expected for this time of year (Office for National Statistics, 2021). Second, lockdown conditions negatively affected the business's informal sector survival. Therefore, there is a need to explore how business organizations could build up governance and accounting practices to use big data to create competitive intelligence to survive during and beyond the COVID-19 conditions. In addition, the number of people employed in the informal sector is likely to increase due to the negative impact of the COVID-19 pandemic on the formal sector jobs.

We draw our contribution from Al-Htaybat and Alberti AlHtaybat (2017) and Cockcroft and Russel (2018), which provide a framework to identify the perceived opportunities and risks of using big data in corporate reporting and accounting and finance. Within this framework, we add to the contribution of Al-Htaybat and Alberti Alhtaybat (2017), which was initially framed within corporate reporting, and identify the significant themes of using big data in accounting. The main focus of our study is to explore how business organizations could build up trust and accountability practices to use big data in creating competitive intelligence advantages to survive during and beyond the COVID-19 conditions.

As indicated in figure one, one of the biggest challenges in accounting today is understanding the implications of using or misusing big data in people's everyday lives. This is true, especially in the business world, where big data is increasingly

coming to bear on the decision-making of customers, managers, shareholders, lenders, suppliers, and employees. As a result, a growing range of issues impacts accounting practices, including social media, innovative products, and virtual business platforms, such as Amazon and eBay. In order to address this agenda, this paper explores how business organizations are increasingly turning to using accounting as a management and organizing tool for big data (Janvrin & Watson, 2017). Big data emerged as evolving research area in health care, computer science, social media, and accounting literature (Arnaboldi *et al.*, 2017). Big data has been used to support decision-making systems and resource allocation. In addition, this research explores how big data could be used as a valuable intangible asset during and beyond the COVID-19 pandemic.

Figure 1: Theoretical Framework, Big data as an intangible asset



The structure of this paper proceeds as follows. Section 2 shows the methodology. Section 3 presents the implementations of big data techniques in the accounting profession. Section 4 reviews the analysis of risk and trust implications of using big data. Section 5 discusses the governance of big data in times of the COVID-19 pandemic. Section 6 presents accounting perspectives of big data applications, opportunities and challenges. Section 8 shows research reflexivity, and finally, section 9 reviews the concluding thoughts, research implications, and key recommendations for future research.

2. Methodology

In this paper, we apply the desk study method to explore companies' possible challenges and opportunities to use big data analytics to survive during and beyond

the COVID-19 conditions. Many prior types of research apply the desk research method to discuss and analyze existing research on a particular topic (Bawole & Ibrahim, 2016; Albitar *et al.*, 2020). Applying this approach provides new accounting perspectives for using big data techniques in business organizations beyond the COVID-19 due to the lack of academic research on using big data in accounting and supporting business organizations (Fiorini *et al.*, 2018). We apply this approach to discuss theoretical and empirical arguments; we draw on comparative thematic analyses of the key issues in the literature related to big data analytics to explain how Big data can be used as a valuable intangible asset to create critical contingencies and help a business survive.

3. Big data implications in the accounting profession

Big Data is defined as "The information assets characterized by such a high volume, velocity, and variety to require specific technology and analytical methods for its transformation into value" (De Mauro, Greco, & Grimaldi, A formal definition of Big Data based on its essential features on its essential features, 2016). It refers to the unique characteristics of data in terms of large volume, richness, size, nature, structure and complexity (Varsarhelyi *et al.*, 2015). It also refers to an implicit way of thinking and perceiving the nature of online businesses (Fiorini *et al.*, 2018) used massively during the global lockdown conditions because of the COVID-19 pandemic in 2020/ 2021. Business organizations use data mining, text mining and sentiment analysis techniques, data modelling, and data analytics as big data management tools to support organizational decisions (Frizzo-Barker *et al.*, 2016). This includes the involvement of big data in shaping organizational strategies and policies (George *et al.*, 2014). Big data represent a unique asset for financial service companies, with no physical product to produce, to business opportunities and strategies (Turner *et al.*, 2013). It identifies business requirements first and then leverages the existing infrastructure, data sources, and analytics to support the business activities. Big data changed the nature of accounting records, measurement, and audit analytics (Vasarhelyi *et al.*, 2015) to incorporate the non-traditional sources of data and the need to change the accounting and auditing standards. This change will be focused on a few main areas of using big data in accounting and finance, such as risk, privacy, ethics, trust, accountability, security, data visualization, real-life predictive analytics, data management and data quality (Cockcroft & Russell, 2018).

In addition, information governance, corporate reporting (Al-Htaybat & Alberti-Alhtaybat, 2017), and customer insights are fruitful areas of future big data research (Clarke, 2016). Trust, risk, and accountability were the most researched areas of big data (Cockcroft and Russell, 2018; Al-Htaybat & Alberti-Alhtaybat, 2017; Vasarhelyi *et al.*, 2015). Therefore, this paper aims to explore how business

organizations could develop accounting practices to use big data to create competitive intelligence to survive during and beyond the COVID-19 conditions.

4. Risks and trust implications for using big data

Business organizations are concerned about the risk and compliance management of big data because the trustworthiness of data represents a key consideration of data processing and management (Panneerselvam *et al.*, 2015). The possibility of missing or misusing data is a significant risk in big data because it involves high integration, complexity, and variety (Bdaily, 2013). Security breaches and data leakage represent another challenge of auditing big data and accounting functions in business organizations (Ramamoorti *et al.*, 2016). The auditability of big data is associated with business accountability in using social media networks and online platforms (Cockcroft & M. Russell, 2018). Using social media and big data offers business organizations new possibilities to build a reputation and interact with customers and stakeholders (Arnaboldi *et al.*, 2017). However, it requires more governance and accountability considerations to maintain a business reputation. The personal and societal risks of re-purposing data drawn from social media networks impact the organizational reputation (Clarke 2016). Online business reputation represents a strategic factor for improving corporate economic performance and business value (Ramos & Casado-Molina, 2021). Big data could be collected for one purpose and used for another, precipitating privacy breaches damaging an organization's reputation (Clarke 2016). The corporate reputation will assess corporate economic performance in terms of the rise of social media like capitalism (Ramos & Casado-Molina, 2021).

Social media and big data have proposed fundamental accounting and accountability practices in business organizations (Arnaboldi, 2017). Corporate accountability involves a clear organizational account to manage a set of stakeholder expectations from different interest groups (Unerman & Bennett, 2004)i. This melange of stakeholder voices was used to provide a rich context of big data that should develop increased levels of stakeholder engagement. This kind of engagement represents a corporate licence managed (maintained) to operate and exist in society.

Coming to understand the trustworthiness of big data, a range of claims were made to argue the possibility to maintain a high level of trustworthiness in managing hundreds of millions of daily amounts of big data (Symons & Alvarado, 2016). The political, legal, and social dimensions of using big data to create values from business activities represent another challenge to maintaining trustworthiness and reliability. Business organizations are trying to use big data as an asset to create organizational values for customers (Zerbino *et al.*, 2018), although the nature of this asset is still unclear. This asset should be trusted, recorded, evaluated, depreciated, audited, and reported from an accounting perspective. For example, conventional

accounting uses financial reporting to provide information about business organizations to people outside the management function (Alexander *et al.*, 2011). We argue that the management can obtain whatever information it needs within the organization, but external users may rely on negotiation or regulations to obtain what they want to know about the organization. This tension represents a key challenge that should be managed by management and regulators in order to obtain the societal licence to operate. Therefore, there is a need to develop accounting standards to manage and report big data in business organizations. The advanced level of this need involves developing ethical and legal accountability practices in business organizations to commercialize big data in creating organizational values.

5. The governance of big data during the COVID-19 pandemic

The COVID-19 pandemic has caused an enormous and tangible impact on health services, business operations, and the global economy (He *et al.*, 2021). However, there is a scarcity of research contributions to big data governance in times of the COVID-19 pandemic. In this section, we review the extant research on the main tools that have been used in managing the governance of big data from an accounting perspective in times of COVID-19. Big data has been used in business organizations as a market-based tool to support decision-making processes (Al-Badi *et al.*, 2018). Competitive intelligence represents one of these market-based tools to manage big data governance. Competitive intelligence is defined as "monitoring competitors to deliver both actionable and meaningful intelligence to organizations" (Ranjan & Foropon, *Big Data Analytics in Building the Competitive Intelligence of Organizations*, 2021). It aims to collect, analyze, interpret and disseminate big data from competitive organizations to create an integrated organizational database of knowledge to support the decision-making process (Acharya, Singh, Pereira, & Singh, 2018). Competitive intelligence was used as an organizational tool to develop organizational and business strategies (Tyson, 1998) and benchmarking mechanisms (Jeong *et al.*, 2021) to support business operations. Using big data in competitive intelligence requires higher governance levels (Shamim *et al.*, 2020) to maintain the confidentiality and accountability requirements of public stakeholders, e.g. policymakers and legal authorities. Big data governance refers to managing vast volumes of an organization's data, exploiting it in its decision-making using analytical tools (Al-Badi *et al.*, 2018). Big data governance must be effectively managed and used to ensure reliability, trust, and consistency.

Nevertheless, the big data could be misused, especially in the COVID-19 pandemic, to direct the business orientation (Rosado, et al., 2021) to be more driven by the main values of wealth accumulation and profit maximization as a form of modern capitalism. Therefore, there is a need to manage big data governance and obtain societal acceptance for this wealth accumulation to obtain the license to continue in

business (Kaletsky, 2010) in times of the COVID-19 pandemic. This view is consistent with the claims for a social contract (Mansell, 2013) embodied in legitimacy theory (Deegan & Blomquist, 2006). The social contract describes how organizations could manage their relationships with different societal stakeholders to survive. Most organizations are expected to survive and continue business for a long time, but only some can survive for future generations. However, from an accounting perspective, it is not clear how business organizations manage big data governance to survive and obtain organizational legitimacy from stakeholders (society) to survive and accept their desires for profit growth and wealth accumulation in times of the pandemic. Business innovation, including developing new products and new processes, has been used as a tool to manage the governance of big data to increase business profitability and support business survival (Ortiz-Villajos & Sotoca, 2018). Factors driving this business innovation provide more opportunities for developing governance-based tools to develop accountability mechanisms to manage wealth accumulation and profit maximization in times of the COVID-19 pandemic. As such, the regulatory (Kempeneer, 2021) and information technologies (He *et al.*, 2021) represent another significant dimension to managing the governance and use of big data (Kempeneer, 2021) in times of the COVID-19 pandemic and the age of the algorithm. Nevertheless, the full governance and accountability of using big data during the COVID-19 pandemic remain uncertain in terms of description, main uses, classification, and usefulness. To this end, we review the main unique characteristics of big data as an intangible asset from an accounting perspective in the next section.

6. Accounting perspectives of big data implications, opportunities, and challenges

This paper aims to develop a coherent analysis for an accounting framework to use big data to support the sustainability of business organizations during and beyond Covid 19 conditions. Therefore, this section reviews the literature to show how accounting practices have been shaped and developed to manage big data in business organizations during the COVID-19 pandemic. It seems significant to analyze the developmental aspects of big data as an intangible asset before explaining the development of these accounting practices. Big data have been used as an organizational asset to enable revenue creation and cost optimization (Kastouni & Lahcen, 2020). In addition, there is a high demand to develop data analysis skills for using big data in accounting (Fay & Negangard, 2017), such as auditing financial statements. Yet, the nature of using big data in accounting practices remains very modest and unclear. In addition, various forms of accounting practices have been investigated through different contexts in the big data literature. For example, Kastouni and Lahcen (2020) highlight the need to examine how big data could and have been used in accounting practices at different levels within organizations. This

effort suggests that a wide range of organizational frameworks be used to understand these practices (De Maura *et al.*, 2016).

Accounting practices provides analytical insights from a combination of novel theorizations, constructivism, and empirical observations to develop and understand the use of big data as a soft asset (Wataya & Shaw, 2019) in business organizations. The meaningful application of this suggestion requires a transparent investigation of the main critique for using big data as an intangible asset. This critique involves the clarification of the merits of these new soft/ intangible assets. Business organizations should decide why they need these intangible assets and the main failures in the conventional accounting practices to be improved by incorporating these soft, intangible assets (Sarkar *et al.*, 2021). In order to explain the conceptual framework of using big data as an intangible/soft asset, the interpretive-hermeneutic circle has been used to identify the characteristics of big data from an accounting perspective. The hermeneutic circle represents one of the main traditions of the interpretive approach (Yanow, 2014). The idea of the hermeneutic circle focuses on how to make sense of complex notions by developing and refining the distinction between two realities. Hence, the hermeneutic circle has been used to identify the primary realities of big data in terms of the actual realities of accounting practices, as indicated in appendix 1. It illustrates the distinction between big data as an intangible/soft asset compared to traditional intangible assets. This distinction involves some conceptual and pragmatic differentiation between the two types of intangible assets. The conceptual aspects of this distinction involve the ontological approaches, materiality of the critical topics, and the description of each framework. The pragmatic aspects of these two intangible assets involve the practical outlines of each framework, such as description, measurement, organizing bodies organizing, controlling and regulatory framework, mechanisms, communication, final outputs, and the challenges of each framework.

The use of big data as an intangible/ soft asset has some attractive benefits. One of these benefits represents the ability to develop a solid foundation and coherent organizational accounts of using big data to support business organizations in the times of the COVID-19 pandemic (Ahmed *et al.*, 2021) and avoid business failure (Amankwah-Amoah & Adomako, 2019). For this reason, when tackling the relationships between traditional intangible assets and big data as a new tangible/soft asset, it is important to clarify these relationships in more detail in the following subsections.

6.1 Theoretical description

There is substantial and increasing importance in studying internally generated intangible assets because they are absent from financial statements and other corporate reports (Lim *et al.*, 2020). Intangible soft assets are unique institutional

assets and context-dependent by nature. They are powerful assets creating value and are connected to other assets to yield outcomes and impact (Wataya & Shaw, 2019). It presents long-term investment decisions (Kang & Kim, 2014) measured and managed by business organizations to create more added values. Big data is described as strategic intangible assets/resources and valuable assets (Perrons & Jensen, 2015) that we could use to gain competitive advantages (Adesemowo, 2021). Intangible assets support debt financing and financial leverage as much as tangible assets do (Lim *et al.*, 2020). For example, highly efficient operations of online businesses such as Amazon, Google, and Micro-Soft during the COVID-19 pandemic have bolstered competitive advantage compared with other businesses. The role of big data and data analytic software became more influential intangible assets because of their new role in managing the implications of the global pandemic, such as social distancing, online- remote education, and communication tools. This new role of big data was described as a set of organizational resources used to manage and support businesses during the COVID-19 pandemic (Adesemowo, 2021; Lim *et al.*, 2020). The organizational interpretation of big data as an intangible asset, in this explanation, seems to be overlooked in some literature in terms of managing and measuring the impact of big data on business activities and transactions.

6.2 Measuring and value creation

The usefulness of big data used to be measured in terms of the main leverage of growth, renewability, efficiency, stability and co-value creation (Wataya & Shaw, 2019). Big data supports decision-making processes by creating high-performance analytics and data management resources (Panneerselvam, 2015) to provide more competitive intelligence. This competitive intelligence represents the core value of big data as an intangible asset. It has been used to create more profits, gain market shares and increase success in a long-term perspective for future generations (Greco *et al.*, 2013). In addition, the value of using big data as intangible assets represented in innovation management to deliver more effective values through using big data (De Mauro, Greco, Grimaldi, & Ritala, In (Big) Data we trust: Value creation in knowledge organizations - Introduction to the special issue, 2018). Customer Relationship Management (CRM) systems represent another value of big data to support organizational value creation and positive organizational impact through social media (De Vecchio *et al.*, 2018). It involves the contemporary phenomenon of using social media as an interaction and communication tool to create value. It is essential to recognize and manage the challenges of misusing big data by developing coherent governance and accountability tools, especially in COVID-19. The new digital world has been created to accommodate how we work and live (Sein, 2020). However, this new digital world will be used to shape our business practices beyond the pandemic. This will involve developing new communication tools with stakeholders to create more unique organizational values using big data.

We argued that regulators and accounting standards setters should intervene in impairment and amortization models for using big data as intangible assets. Amortization methods and periods should be considered at three levels of analysis: individual, firm and country (Ferramosca & Allegrini, 2021). The main point of contention is the adoption of the impairment-only approach or the amortization model (Wen & Moehrle, 2016) and the process of annual testing. Therefore, it is necessary to develop amortization-based big data, accounting model. This model should involve the mechanism of annual testing (Wen & Moehrle, 2016), impairment mechanisms (Ferramosca & Allegrini, 2021), the risk exposure of misusing big data (Panneerselvam, 2015). We suggest three points of contention regarding the use of amortization models of big data. First, how to estimate the useful economic life of big data as intangible assets by using the relevance-based approaches (Park & Jang, 2021) to identify the duration of big data usage, collection, and processing times. Second, how external stakeholders evaluate and perceive the use of big data as intangible assets. Third, accounting standard setters and regulators could identify the financial valuation of big data core values such as competitive intelligence, governance, income generation, and decision-making support.

6.3 Organizing and controlling framework

Traditional intangible assets are usually organized and managed by some forms of regulatory frameworks. Accounting standards are developed procedures and some forms of societal accommodations to gain faithful and accurate representation (Riahi-Belkaoui, 2004). Leiwy & Perks (2013) argued that the problems of creative accounting represent one of the main challenges of setting accounting standards. Accounting standards setters are steadily becoming stricter to reduce and minimize choices in order to provide more enforcement mechanisms for proper accounting treatment (or implementation). Creative accounting includes the moderate and evolutionary changes that should be undertaken to simplify accounting rules and standards (Leiwy & Perks, 2013). We argue that creative accounting is still alive and valid within some accounting standards. For example, there are several choices in how companies can measure and report their impact and value creation process beyond the pandemic. Nevertheless, the key challenge was summarising and concluding the detailed accounting standards to ensure the ease of the implementation process in business organizations.

The governance of big data is controlled by compulsory and non-compulsory frameworks. The compulsory framework involves the General Data Protection Regulations (GDPR) in the era of big data (Tamburri, 2020). However, the usage and the measures of GDPR have a massive influence over the usage of data analytics technologies and their usefulness as institutional resources.

The non-compulsory (voluntary) guidelines and protocols for monitoring big data as intangible assets were covered in the overall context of the Global Reporting

Initiative (GRI, 2013)ⁱⁱ (GRI) and the United Nations Environmental Programme Finance Initiative (UNEP FI, 2011). However, international institutional entrepreneurs such as United Nations, non-governmental organizations, professional accounting bodies, and social associations have developed these voluntary and organizing guidelines. However, some research attempts in accounting literature have been undertaken to organize the use of big data as intangible assets (Lim *et al.*, 2020; Greco *et al.*, 2013). In addition, Lim *et al.* (2020) argued that effective management of intangible assets requires generally accepted standards to manage the global guidelines that have been setted by the powerful international institutions (such as professional accounting bodies) in order to ensure the effective implementation of these guidelines (e.g. GRI reporting model). The extensive increase in these international guidelines and organizational attempts to implement them in business activities seems to broaden accounting as a field of action for the stakeholders.

6.4 Big data recording mechanism

A double-entry recording mechanism was used to register financial business transactions (including intangible assets) in order to prepare financial statements and compulsory reports (Leiwy & Perks, 2013). Historically, the double-entry bookkeeping system has been used to record financial data in accounting since the sixteenth century (Crowther, 2004). This data recording system had been developed in the UK to record and serve different national and governmental needs. These needs involved many public activities such as recording the collected taxes and funds collected to fund the Napoleonic Wars, funding the financial demands of railways, and protecting shareholders and creditors in their dealing with companies. The double-entry recording system was used originally to record financial transactions, as indicated in the following quote:

'Amongst the conventions used is the double aspect convention. This means that all transactions are entered twice, once as a debit and once as a credit. This is known as double-entry bookkeeping, which is a founding principle of accounting... The double-entry method ensured accuracy in recording financial transactions in the period before computer packages became widely available. (Crowther, 2004; pp. 28-29)

However, the double-entry recording system (the balance between debit and credit sides) represents a key factor in maintaining the financial balance of the balance sheet and the other financial accounts.

6.5 Big data reporting mechanism

Intangible assets are usually reported in financial statements to be provided to internal and external users (Alexander *et al.*, 2011). We argue that the big data value creation processes and mechanisms should be reported to stakeholders using the

value relevance logic (Park & Jang, 2021), such as value drivers, institutional relationships, knowledge, and organizational culture (Greco *et al.*, 2013). However, the management can obtain whatever information they need within the organization. Still, external users may rely on negotiation or regulations to obtain what they want to know about the organization. This tension represents a critical challenge that should be managed by accounting standards setters and regulators in order to obtain the societal licence to operate (Mansell, 2013).

Most of the big data reporting mechanisms are organized by voluntary reporting frameworks. There are at least two possibilities to understand the importance of big data reporting as intangible assets. The first one came from the need to develop them as regular business practices. The second possibility came from engaging and communicating with the most influential stakeholders to report the organization's impact and transparency (Park & Jang, 2021). One of the primary purposes of big data reporting is to create actual behavioural development to change management strategies and information systems. In addition, big data reporting practices represents additional accounts of the social contract (Mansell, 2013) to manage some of the organizational externalities and alleviate the consequences of economic activities. The information flow of this contract (between an organization and its stakeholders) involves some legal, ethical, and societal considerations that should be used to understand the notion of corporate accountability. Accordingly, the core business of the big data reporting practices involves the communication of information (e.g. value relevance, transparency, and accountability) concerning the organizational impact on society.

6.6 Big data valuation mechanism

Big data valuation involves related information like how a company uses big data to support business strategies, decisions, and impact (Park & Jang, 2021; Greco *et al.*, 2013). The non-financial valuation of big data used to be missing in the accounting literature. However, there are two different meanings of big data valuation as a notion. These two meanings are formal and informal meaning. The International Integrated Reporting Council (IIRC, 2013) focused on the formal meaning of integrated reporting as a source of value creation. The informal meaning of integrated reporting was focused on using integrated reporting to describe how organizations could integrate financial and non-financial data in corporate reporting (see Leiwiy & Perks, 2013).

Some big data valuation practices have been developed to describe the value of big data analytic software. For example, Lim *et al.* (2020) argued that organizations should evaluate the results of using big data to assess the access of value creation processes. However, this kind of valuation practice ignores the value of misusing big data on the company's sustainability for future generations. In addition, the

organizational impact was assessed based on the principles of social contract theory to identify the accountability level of organizations (Mansell, 2013). This level of accountability should be assessed based on the relationships between stakeholders and management.

6.7 The materiality and power of using big data

The notion of materiality was used to identify the significant importance of accounting information that should be disclosed by an organization based on the influence of this information in the decision-making process (Alexander *et al.*, 2011). We argued that the organizational treatment of this materiality might involve some conflict between management intentions and the needs of other users. Hence, traditional intangible assets (such as patents and copyrights) focus on measuring the value creation and the direct values of these intangibles (Lim *et al.*, 2020). It ignores the other related dimension and values of using big data as intangible assets, such as the value of competitive intelligence and the risk of misusing big data.

The materiality criterion helps organizations decide on the most relevant and related information to be disclosed for stakeholders' benefit (Alexander *et al.*, 2011). The organizational choices of material information may influence stakeholders' decisions toward the organizational activities and services. Therefore, identifying material information requires an organizational mechanism to identify the needs of the most influential stakeholders to disclose the most relevant and required information about big data.

6.8 The outreach

Financial reporting is about communicating financial information about a business entity to its internal and external users (Maynard, 2013). Financial reporting was used to understand and interpret the necessary big data capabilities for organizational activities (Hatherly, 2013). We argued that the management process of big data capabilities involves some organizational preferences to deliver specific information for certain users to influence their actions in a particular direction. For example, business organizations disclose the information of corporate analytics (Greco *et al.*, 2013) to institutional investors in order to create a legitimate image of their whole organizational activities.

In addition, some academic attempts have been developed to assess the reporting process of big data outside financial reports (Pei & Vasarhelyi, 2020). Pei & Vasarhelyi (2020) developed an accounting system to overcome the slow speed of information dissemination and the relevance of financial reporting. However, this attempt ignores the dynamics and prioritization of using big data in the COVID-19 pandemic.

6.9 Boundaries

Conventional accounting focuses mainly on financial issues of business transactions, with some limited emphasis on non-financial issues like the influence of big data and the relevance of financial reporting (Maynard, 2013). However, the non-financial data of business transactions may involve some important information that could affect the strategic organizational performance in the future, such as management perception of climate changes and environmental risks (Hatherly, 2013). For example, integrated corporate reporting is based on integrating financial and non-financial aspects to link corporate services, strategies, data governance, and the usage of big data to create value for present and future generations (IIRC, 2013). However, the boundaries of conventional accounting seem to ignore the interconnectedness between the financial components of corporate performance and the usage of big data (Kastouni & Lahcen, 2020) in supporting intangible assets, business activities and decisions.

6.10 Big data challenges and limitations

There are some significant opportunities and challenges in using big data as intangible assets. These opportunities explore the combined forms of integration between financial and non-financial reporting practices (Humphrey *et al.*, 2014) and the usage of big data. The intellectual spaces between financial and non-financial reporting seem to be less organized or regulated by the regulatory and professional bodies during the times of the COVID-19 pandemic.

Business organizations are unwilling to adequately understand and use big data as intangible assets (Kastouni & Lahcen, 2020). In addition, the absence of a regulatory and compulsory framework for using big data as intangible assets represents a major criticism of big data management. The main argument of this section is that the practical and theoretical structure of big data should be identified/ defined based on the relevance of value-based consideration (Park & Jang, 2021). For example, accounting for big data practices should be managed to re-produce conventional accounting to manage the main imperatives of intangible assets such as goodwill, patents, copyrights, and intellectual properties. This process involves some fundamental challenges and impediments, e.g., big data measurement (quantification) and the lack of institutional expertise to manage these imperatives in business organizations during the COVID-19 pandemic. Therefore, the following section aims to clarify the role of big data as intangible assets to support business organizations beyond the COVID-19 pandemic.

7. The impact of big data on supporting business organizations to survive beyond the COVID-19 pandemic

COVID-19 and lockdown conditions negatively affected the survival prospects of many business organizations after the pandemic. The COVID-19 pandemic also affected human behaviour and business practices all over the world. Specifically, it has created new digital word and business patterns and challenges. These changes require new innovative accounting and financial perspectives to help the business organization survive beyond this pandemic (Li, 2020). In this regard, Li (2020) argued that the relief funds were less likely to help small business organizations maintain their normal business activities. Instead, it helped small businesses to reduce their revenues and employees' hours. We argue that the massive reduction of business capacity and operations will interpose the accounting and financial practices beyond the pandemic. Therefore, there is a need to uncover the underlying business practices and market circumstances toward the radical shifts in business and society (Anker, 2021). Critical contingencies represent one of the leading business strategies to manage the shift in customer demand and business risks (Margherita & Heikkilä, 2021). Big data has been used as a valuable asset, rather than something valuable in itself, to create these critical contingencies (Perrons & Jensen, 2015). Perrons & Jensen (2015) suggested future research augmenting in-house big data assets to be collected, formatted, stored, and owned by business organizations.

8. Research reflexivity (the pros and cons of the specialists)

This section aims to clarify the potential impact of this research in the accounting literature and outline its significance on the research choices made. Self-reflexivity is the process of managing the interaction between the researcher's perceived experience and post-understanding of social objects (Haynes, 2012). It refers to the processes of understanding new ways of thinking as indicated in the following quote:

'Reflexivity is an awareness of the researcher's role in the practice of research and the way this is influenced by the object of the research, enabling the researcher to acknowledge the way in which he or she affects both the research process and outcomes... In other words, researcher reflexivity involves thinking about how our thinking came to be, how a pre-existing understanding is constantly revised in the light of new understandings and how this, in turn, affects our research'.

(Haynes, 2012; PP 72-73)

The pre-existing experience represents a rich source of knowledge that could be used to create a specific kind of understanding. Indeed, assessing the role of the researcher's experience in creating or interpreting any new form of knowledge needs to be reflected upon. Therefore, we reflect on how theoretical, ideological and reflexive assumptions inform the interpretation of using big data as an intangible

asset (Alvesson & Sköldbberg, 2010). The main emphasis was on the analysis of critical reflexivity factors and levels of domains, e.g. research objective, literature, and review of contemporary accounting roles. In addition, the analysis has been used to address accounting practices such as procedures, activities and data recording and reporting mechanisms. Moreover, the connections between big data and accounting have been used to gain the most detailed categories of accounting practices and create a holistic understanding of these practices.

Consequently, we contribute to the literature in the following three main areas. First, we highlight the inter-disciplinary connections between big data and accounting practices during and beyond the COVID-19 conditions (Sarkar, 2021). Second, we developed some practical frameworks to manage big data as an intangible asset. This process could help us understand and interpret the pandemic's positive and negative implications for our accounting practices and system thinking (Larrinaga, 2020). Third, we offer some possibilities to understand and explore the role of accounting in addressing global crises and challenges such as climate change and human rights (Michelon, 2021). In addition, we believe that there is significant future research on exploring the role of accounting in thriving businesses to survive beyond the pandemic. This development suggests that accounting could be used as a planning and organizing boundary (Cho, Senn, & Sobkowiak, Sustainability at stake during COVID-19: Exploring the role of accounting in addressing environmental crises, 2021), not just as representing data to provide visibility to innovate new ways to support business growth and sustainability. This substantive role of accounting may go beyond the old approaches to create climate-neutral businesses (O'Dwyer & Unerman, 2020) and a new compulsory framework for sustainability accounting (Cho, CSR accounting 'new wave' researchers: 'Step up to the plate'... or 'stay out of the game, 2020).

This research's main focus was on exploring the possible challenges and opportunities for companies to use big data as an intangible asset to survive during and beyond the COVID-19 conditions. Nevertheless, it is hoped that future research will be undertaken regarding specific ways in which business and accounting specialists (e.g. academics, assurance companies, accounting firms and other standard setters) are able to develop new accounting practices to use big data as intangible assets to create more stakeholders' value. This suggested research could provide a new practical role for accounting (Cho *et al.*, 2021; Michelon, 2021) that should be created to increase organizational effectiveness (Jarzabkowski *et al.*, 2012). In addition, this kind of research may explore more innovative accounting practices to reinforce business sustainability beyond the COVID-19 conditions. In addition, we suggest that big data as an intangible asset may involve some practical challenges and limitations to innovating a new contemporary accounting framework. These challenges may involve the pressure to encourage standard setters to develop a compulsory accounting framework to support business organizations to manage and measure this unique intangible asset. In turn, these pressures might be considered

as a starting point to address the unfavourable aspects or disadvantages of the conventional accounting framework.

9. Concluding thoughts, research implications and key recommendations for future research

This paper has theoretically discussed how big data applications can be used as soft, intangible assets to help business organizations survive during and beyond the COVID-19 pandemic. Using a desk study methodology, this study contributes to the ongoing accounting debate about big data as follows. First, the paper presents a new theoretical framework to manage big data as a valuable intangible asset. This theoretical framework describes big data as a unique institutional asset that represents long-term investment measured and managed by corporations to gain competitive advantages and create added values. Second, the paper provides theoretical thoughts and insights on how business organizations could manage the accounting implications of this suggested theoretical framework. Crucially, it provides accounting suggestions on assessing, recording, and reporting big data as an intangible asset. Third, it proposes new insights on how big data could support business organizations to survive beyond COVID-19. Fourth, this paper generates new perspectives on the governance and risk of using big data to achieve competitive intelligence advantages. Fifth, this paper delivers a contemporary theoretical comparison (lenses) between big data as valuable intangible assets and traditional intangible assets in order to highlight the main structure of the proposed accounting framework for managing big data applications. Indeed, it provides new accounting perspectives for using big data techniques in business organizations beyond the COVID-19.

This paper provides practical implications for accounting standard setters, accounting practitioners, corporate managers, and academics to uncover the main contemporary accounting considerations for using and misusing big data during and beyond the COVID-19 pandemic. The professional management of these practical considerations involves some themes of the traditional form of institutionalism. This form of institutionalism provides formal structure, norms and values to improve business practices beyond the COVID-19 pandemic. In addition, this paper explains corporate competencies and capabilities to manage big data from accounting perspectives.

This paper suggests some key directions for future research: First, a qualitative research approach, including interviews and observations, is recommended to identify the required organizational values and norms to manage big data as a valuable intangible asset and key component of the social contract between organizations and society. Second, further studies are required to explore how accounting could use big data to support resource allocation, risk management; cost

of capital; earning management; financial performance; and accounting decisions. Third, other forward rafts of research thoughts could be developed to explain the role of big data in bridging the gap between the required accounting practices and the new market demands beyond the COVID-19 pandemic.

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Appendix 1: Comparison between big data as an intangible asset and traditional intangible assets

Criteria	Big data as an intangible/ soft asset	Traditional intangible assets
Theoretical description	The information assets characterized by such a high volume, velocity, and variety to require specific technology and analytical methods for its transformation into value" (De Maura <i>et al.</i> , 2016; Perrons & Jensen, 2015).	Intangible (knowledge) assets, such as new discoveries (drugs, software, etc.), brands or unique organizational designs (e.g., Internet-based supply chains), are non-physically embedded sources of future benefits (Gu & Lev, 2011).
Measurement and value creation	The significant value of big data is based on the possibility of driving meaningful decision-making (Panneerselvam <i>et al.</i> , 2015). The	The value of intangible assets cannot be measured by the inputs of intangible investment due to the high risk of the investment.

Criteria	Big data as an intangible/ soft asset	Traditional intangible assets
	<p>data volume is measured more in terms of bandwidth than its scale.</p> <p>Growth and renewal</p> <p>Stability</p> <p>Efficiency</p> <p>Co value creation flow (Wataya & Shaw, 2019).</p>	<p>There are three categories of intangible measurement methodologies (Gu & Lev, 2011):</p> <p>(1) Market value approach,</p> <p>(2) Accounting valuation approach, and</p> <p>(3) Component valuation approach</p>
Organizing and controlling framework	<p>GDPR</p> <p>GRI</p> <p>The UNEP FI</p>	<p>Regulators</p> <p>Supervisory authorities</p> <p>Professional accounting bodies</p> <p>International accounting standards</p> <p>Financial Accounting Standards Board (FASB).</p> <p>Federal Accounting Standards Board (FASB)</p>
Big data recording mechanism	<p>Structured and unstructured methods to register and record big data to produce new insights and innovations (Panneerselvam <i>et al.</i>, 2015).</p>	<p>Intangible assets are recorded at their estimated fair values at the date of acquisition (Lim <i>et al.</i>, 2020).</p>
Big data reporting mechanism	<p>Voluntary reporting framework, especially for unidentifiable big data sets such as intellectual capital (Pei & Vasarhelyi, 2020)</p>	<p>Identifiable and unidentifiable intangible assets are reported in the financial statements (Peters & Taylor, 2017)</p>
Big data valuation mechanisms	<p>There are not any unified and well-established to identify the financial values of big data sets. However, the data analytics software should be evaluated as one component of big data (Lim <i>et al.</i>, 2020)</p>	<p>Financial valuation</p> <p>Market value</p> <p>Fair value</p> <p>Investment appraisal techniques for data analytic software</p>
The materiality and power of using big data	<p>The benefits of big data are focused on creating innovative insights to create competitive intelligence.</p>	<p>How to report the important information about intangible assets such as goodwill, intangible capital, patents and copyrights</p>
Outreach	<p>Supporting the decision-making processes and creating unique competitive intelligence.</p>	<p>Communicating financial and non-financial information to users</p>

**Accounting Perspectives on the Business Value of Big Data During
and Beyond the COVID-19 Pandemic**

Criteria	Big data as an intangible/ soft asset	Traditional intangible assets
Boundaries	How big data are evidenced in the decision-making process and organizational activities to enable revenue creation and cost optimization (Kastouni & Lahcen, 2020)	Financial matters with limited emphasis on unidentifiable intangible assets
Challenges/ limitations/	The absence of the accounting and compulsory framework for managing big data.	The intellectual spaces between identifiable and unidentifiable intangible assets and their financial assessments

ⁱ The main context of this paper focused on addressing some of the practical challenges (problems) of stakeholder engagement. Some of these challenges represent the need to identify and reach a wide range of stakeholders and develop a set of stakeholder expectations from different stakeholder groups.

ⁱⁱ G4 represents the latest sustainability reporting guidelines framework that has been developed by the GRI. These guidelines offer reporting principles, standard disclosures and an implementation manual for preparing a sustainability report. It also offers an international reference for all those interested in the disclosure of governance approach and social, environmental and economic performance. For more information see <https://www.globalreporting.org/reporting/g4/Pages/default.aspx> (Accessed on 30th March 2021)