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ORIGINAL ARTICLE

Impact of big data analytics in project success: Mediating role of intellectual capital and knowledge sharing

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ABSTRACT

Purpose: This study empirically investigates the effect of big data analytics (BDA) on project success (PS). Additionally, in this study, the investigation includes an examination of how intellectual capital (IC) and (KS) act as mediators in the correlation between BDA and KS. Lastly, a connection between entrepreneurial leadership (EL) and BDA is also explored. Design/Methodology- Using a sample of 422 senior-level employees from the IT sector in Peru. The partial least squares structural equation modeling technique tested the hypothesized relationships. Findings- According to the findings, the relationship between BDA and PS is mediated by structural capital (SC) and relational capital (RC), and BDA demonstrates a positive and noteworthy correlation with PS. Furthermore, EL is positively associated with BDA in a significant manner. Practical implications- The finding of this study reinforce the corporate experience of BDA and suggest how senior levels of the IT sector can promote SC, RC, and EL. Originality/Value- This study is one of the first to consider big data analytics as an important antecedent of project success. With little or no research on the interrelationship of big data analytics, intellectual capital and knowledge sharing the study contributes by investigating the mediating role of intellectual capital and knowledge sharing on the relationship between big data analytics and project success.

KEYWORDS

big data analytics; project success; intellectual capital; knowledge sharing

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1. Introduction

Businesses face uncertainty, complexity, rivalry, and rapid change (Iqbal et al., 2018). Big data analytics (BDA) has been widely touted for its role in corporate decision-making. (McAfee et al., 2012). Businesses are accelerating BDA efforts to gain valuable insights that will give them a

competitive edge. (Mikalef et al., 2020). Organizations use the latest data processing and strategic decision-making technologies to stay ahead in a constantly changing business climate. Recently, businesses have noticed the value of using large amounts of data to improve organizational outcomes like project success and have become more apt to use BDA. (Grover et al., 2018). Despite BDA's many promises, research on how organizations must be organized to produce business value from such investments and the factors that drive performance advances is scarce (Mikalef et al., 2018). Consulting firms, the popular press, and isolated case studies have produced most BDA value reports, which lack empirical results from large-scale analyses and theoretical insight. (Mikalef et al., 2019). An empirical study on BDA's competitive potential is still in its infancy, with little knowledge of how such investments lead to organizational outcomes like project success. (Gupta and George, 2016).

BDA is a relatively new addition to academic research that has attracted the interest of researchers and practitioners. With a significant focus on psychological factors that impact project success (PS) (Angrave et al., 2016), there is a significantly limited focus on technological factors that can affect project success. Scholars have only recently begun to focus on BDA and its function in project management literature. Scant research has been conducted on how BDA influences PS (Ahmed et al., 2022). In the existing literature, it is unclear whether BDA can eventually contribute to an increase in the success rate of projects (Bahrami and Shokouhyar, 2022). Thus, it is necessary to further investigate the relationship between BDA and PS by determining if BDA influences PS (Mangla et al., 2021). The authors contend that more empirical research is required to explain how BDA effects are diffused and gains are realized (Mikalef et al., 2020).

This research highlights several areas of knowledge gaps concerning the connection between BDA and PS. To address these crucial gaps in the existing literature, this study aims to deepen our comprehension of how BDA contributes to improving PS. To gain a competitive edge that is challenging for competitors to replicate, businesses must acquire and nurture a blend of technological, human, financial, and intangible resources. While some studies have recently embraced this comprehensive perspective on BDA, there remains a limited understanding of how BDA specifically influences organizational outcomes. Recent research suggests that the impact of BDA on organizational outcomes is indirect and relies on other corporate initiatives as mediators (Mikalef et al., 2018). To derive meaningful theoretical and practical implications and identify critical areas for future research, it is essential to determine whether the fundamental elements related to BDA lead to the development of intellectual capital and knowledge sharing (KS), ultimately leading to project success, and how these effects are brought about. Consequently, the literature has identified several gaps in the areas of BDA, intellectual capital, knowledge sharing, and project success.

First, despite the increased interest in BDA, the notion of BDA remains largely underdeveloped (Mikalef et al., 2019). The only notable study on the relationship between BDA and Project success has been conducted by Ahmed et al. (2022). This demonstrates that BDA literature has not yet permeated the world of project management. Ahmed et al. (2022) study assessed the direct relationship between BDA and PS and further investigated the moderating role that decision-making plays in the relationship. However, they did not consider any intervening variable that can explain the mechanism of impact of BDA on PS. Hence, there is a clear need to find out how BDA capabilities could affect organizational traits and how that would affect performance.

Second, significantly limited but existing research has assessed the impact of BDA on knowledge outcomes and IC. Ferraris et al. (2019) evaluated the effect of BDA the knowledge management orientation. However, the study failed to identify the impact of BDA on individual knowledge management processes. Further, Gravili et al. (2021) assessed the effect of the management of intellectual capital with BDA on organizational performance in healthcare based on panel data. The study did not explicitly evaluate BDA's effects on developing intellectual capital. Hence, significantly limited research has assessed how BDA can facilitate IC and Knowledge sharing in project-based organizations.

Third, the relationship between BDA and organizational outcomes has been studied considering different mediating variables (Waqas et al., 2021); hence the direct relationship between data analytics and PS can be questionable. To explain the mechanism of impact of BDA on PS, the study considers IC and KS as possible mediators in the relationship between BDA and PS. Several methods exist in which BDA can facilitate the development of IC and KS. BDA can be used to find patterns, trends, and insights by mining and analyzing large amounts of data, this information can be used to create new IC, such as best practices, procedures, and methods, that can be shared across the organization (Vassakis et al., 2018). BDA can be a powerful tool for helping an organization build IC and increase the KS; by mining and analyzing large amounts of data, organizations can find valuable insights and information that can be used to help make decisions and guide the development of new intellectual capital (Harlow, 2018).

Fourth, limited existing has assessed the impact of antecedents affecting BDA like expected performance, social influence, and cost–benefit (Moraes et al., 2022). Why studying ancestors is essential. This can assist organizations in assessing their preparedness for BDA adoption and developing strategies to address potential adoption barriers (Lai et al., 2018). This can help organizations optimize their BDA performance by concentrating on the critical variables that drive BDA success (Bag et al., 2020).

The theoretical lens for the study is based on the resource-based view (RBV) and dynamic capability theory (DCT). RBV is a framework for strategic management that concentrates on an organization's internal resources and capabilities to achieve a sustainable competitive advantage (Barney et al, 2001). This suggests that a company's competitive advantage is determined by its unique and valuable resources, which are difficult for competitors to replicate or acquire. The DCT is a management framework that posits firms can attain and maintain a competitive advantage by continuously adapting their resources and capabilities to a fluctuating market environment (Teece et al., 1997).

This research aims to address the identified knowledge gaps and makes several valuable contributions. Firstly, it expands upon the limited research regarding the influence of BDA on PS. Notably, this study stands among the pioneering ones to investigate BDA as a significant antecedent of PS, focusing specifically on its impact on IT firms.

Secondly, considering the lack of substantial research on the effects of BDA on IC and KS, this study delves into the exploration of whether BDA serves as a crucial predictor of IC and KS. This endeavor seeks to shed light on the potential relationship between BDA and these essential elements of organizational success. Thirdly, the study takes a step further by examining whether IC and KS act as mediators in the relationship between BDA and PS. Such an analysis provides a basis for

comprehending the underlying mechanisms through which BDA influences PS. By understanding these mediating processes, a more refined theoretical understanding of the BDA-PS relationship can be formulated. Fourthly, the study contributes to the understanding of factors like leadership and how they interact with the influences of big data analytics. By investigating these aspects, it offers valuable insights into the complex dynamics shaping the impact of BDA on PS. Finally, the research contributes to the advancement of Resource-Based View (RBV) and Dynamic Capability Theory (DCT) by demonstrating the role of BDA in enhancing PS through its effects on IC and KS. This analysis deepens our understanding of how BDA fits within these theoretical frameworks and its implications for organizational success.

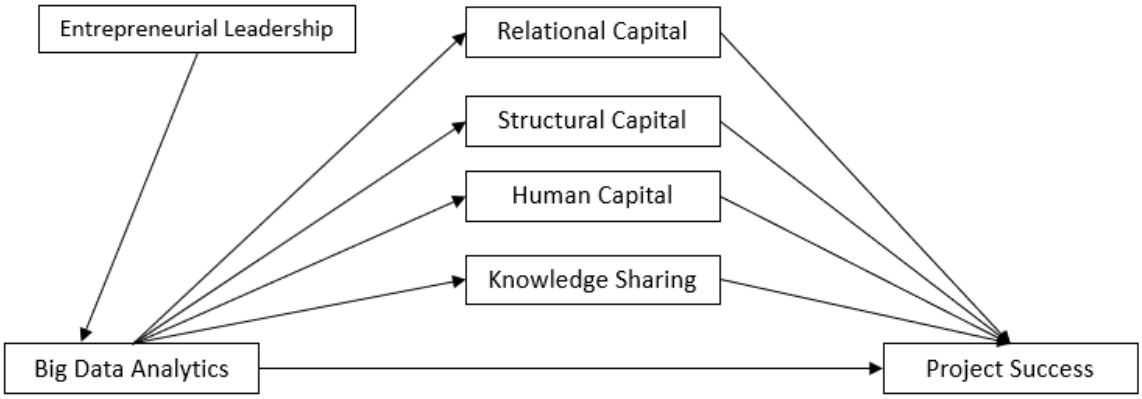

Figure 1. Research framework.

2. Theoretical background and hypotheses development

2.1. Big data analytics

BDA examines extensive, complex data sets to find hidden patterns, correlations, and insights that can guide business decisions. (Tao et al., 2020). BDA is the massive amount of structured and unstructured data produced by social media, mobile devices, sensors, and other digital communication. (Istepanian and Al-Anzi, 2018). BDA helps organizations make choices by gleaning insights from data. Trends, patterns, and connections are found in large data sets. (He et al., 2017). Machine learning, natural language processing, and predictive modeling are used to mine big data (Müller et al., 2016). The term Big Data Analytics (BDA) pertains to the methodical utilization of sophisticated data analysis and prediction skills that are incorporated into the diverse business processes of an organization (Oesterreich et al., 2022). The process entails the regular exploitation of advanced technology by employees to leverage the potential of extensive datasets, facilitating decision-making based on data, development of insights, and optimization of corporate operations (Park and Singh, 2023).

2.2. Big data analytics and project success

BDA helps project managers make informed choices. (Frisk and Bannister, 2017). Project managers can optimize resource usage, modify project timelines, and improve future performance by analyzing large amounts of data to find trends and patterns. (Yang and Bayapu, 2020; Wang et al., 2018). Big data analytics can help project managers spot resource bottlenecks and underutilization,

improving project success through resource allocation. (Obondi, 2022). The RBX theory explains how big data analytics can give project-based organizations a competitive edge by helping them make informed choices, optimize resource utilization, and find areas for improvement. (Fosso Wamba et al., 2018). Companies that can rapidly adapt to changing market conditions and customer demands are better positioned for success in a changing business climate. (McAfee et al., 2012). According to the RBV, BDA unique resources and skills help organizations succeed with projects (Korherr and Kanbach, 2023). Data infrastructure, advanced analytics tools, and professional staff enable the extraction of important insights for informed decision-making and effective project execution (Mikalef et al., 2018).

In conclusion, BDA can help project managers optimize resource utilization, enhance decision-making, and gain valuable insights (Wang et al., 2019). Hence, it can be proposed that:

H1: There is a significant and positive impact of big data analytics on project success.

2.3. The mediating role of human capital

HC refers to an organization's employees' knowledge, skills, and abilities. It includes an employee's education, training, experience, and how they implement this knowledge in their work (Youndt and Snell, 2004). By applying big data analytics on employee performance, engagement, and satisfaction, organizations can obtain insights that will assist them in making more informed decisions regarding human capital allocation, development, and retention (Ram and Zhang, 2022). Big data analytics in human capital management can assist in identifying patterns and trends that may not be readily apparent (Batko and Ślęzak, 2022). By using big data analytics on employee engagement and satisfaction, organizations can identify the most important factors for employee retention and take measures to address them (Moreno et al., 2022).

The relationship between big data analytics and human capital can be further explained in light of the DCT. Companies must be able to recognize and capture opportunities created by the proliferation of big data analytics and the rising value of human capital (Erevelles et al., 2016). Firms must cultivate the dynamic capabilities of sense-making, which refers to their ability to recognize and interpret market and internal environment signals; companies must discern the opportunities and challenges that big data analytics and human capital present (Pundziene et al., 2022). Firms with dynamic capabilities can use big data analytics and human capital to create and maintain a competitive advantage (Horng et al., 2022). The use of DCT offers a valuable conceptual framework for comprehending the increasing interplay between big data analytics and human capital (Babu et al., 2021). It is imperative to underscore that firms possessing robust dynamic skills in effectively utilizing data analytics for human resources (HR) operations are more adept at responding to evolving workforce difficulties and fostering sustained success in the long run (Shan et al., 2019).

Project teams are comprised of individuals with diverse skills, knowledge, and experience, and their ability to collaborate effectively can substantially influence project outcomes (Radhakrishnan et al., 2022). Important aspects of human capital for project accomplishment are skills and expertise; teams must possess the necessary skills and knowledge to complete a project (Singh et al., 2022). This incorporates technical and soft skills, including communication, teamwork, and problem-solving. Human capital management can assist in optimizing resource utilization and

enhancing project results by aligning the talents and knowledge of team members with the project's requirements (Civera et al., 2022).

The relationship between HC and PS can be further explained using RBV. Effective human capital management can assist project teams in developing the necessary abilities, knowledge, and experience for PS (Chowdhury et al., 2023). By connecting the skills and expertise of team members with the project's requirements, project managers can ensure that all available resources are utilized effectively and efficiently. This can result in better project outcomes, such as faster completion timeframes, higher-quality deliverables, and increased stakeholder satisfaction (Alghail et al., 2022). The RBV approach emphasizes the importance of human capital as a crucial resource that plays a significant role in the achievement of project success (Calabrò et al., 2021). It is crucial to underscore the significance of firms that allocate resources towards the cultivation and proficient utilization of their human capital, as these entities are more inclined to achieve exceptional project execution and get a competitive advantage (Sing et al., 2022). Based on the arguments, it is proposed that:

H2: There is a significant and positive impact of BDA on HC.

H3: There is a significant and positive impact of HC on PS.

The literature above suggests that BDA can impact HC (Batko and Ślęzak, 2022), which can influence PS (Singh et al., 2022). Hence, the following hypothesis is proposed:

H4: Human capital mediates the relationship between big data analytics and project success.

2.4. The mediating role of relational capital

RC is an intangible asset that alludes to the value an organization derives from its relationships with its stakeholders, such as customers, suppliers, partners, and employees (De Leaniz and Del Bosque, 2013). It consists of the network of relationships and the trust, benevolence, and reputation it has cultivated with the stakeholders (Pant et al., 2022). BDA can analyze consumer behavior, preferences, and feedback, enabling businesses to customize their offerings and increase customer satisfaction (Zarezadeh et al., 2022). This can help create solid client connections and improve the organization's relational capital. BDA can assist organizations in monitoring and analyzing social media activity to determine how consumers view the organization and its products/services (Vassakis et al., 2023). BDA can help analyze the relationships between suppliers, partners, and consumers in an organization's ecosystem (Ciasullo et al., 2022). This can aid organizations in identifying vital connections and enhancing their RC.

The relationship between BDA and RC can be further explained in light of the DCT. BDA can assist businesses in comprehending the requirements and preferences of consumers and other stakeholders, this comprehension can enable businesses to develop more robust and meaningful relationships with their stakeholders (Cetindamar et al., 2022). Companies can use big data analytics to personalize their products and services, enhance customer service, and target specific customer segments with their marketing efforts (Del Vecchio et al., 2022). Companies with dynamic capabilities can leverage the potential of BDA and RC to establish and maintain a competitive advantage (Horng et al., 2022). The integration of BDA into RC can yield enhanced stakeholder connections, heightened trust, and competitive benefits, as elucidated by DCT (Alkhatib and Valeri,

2022). Organizations that develop and enhance their dynamic capabilities in utilizing BDA are more effectively situated to negotiate intricate and ever-changing connections with stakeholders in the contemporary business environment (Pütz et al., 2023).

Robust RC can facilitate collaboration and trust between project team members, stakeholders, and partners (Xu et al., 2022). Trust facilitates open communication, the sharing of knowledge, and a propensity to cooperate, which can enhance the PS (Ng, 2022). RC can also assist organizations with risk management. Strong connections with vendors, for instance, can provide access to resources and expertise that can mitigate project risks and increase project success (Zhong et al., 2022). By facilitating trust and collaboration, managing project risks, enhancing the organization's reputation, and enhancing customer satisfaction, RC can contribute to PS (Wang et al., 2022).

RBV can help further explain the relationship between RC and PS. Relational capital can be an organization's source of value creation; strong customer relationships, for example, can provide access to valuable customer insights and feedback that can inform the design and development of a project (Itani et al., 2023). Not every business possesses robust RC. Consequently, those who do may have a competitive advantage in project management, particularly in managing stakeholders, mitigating risks, and increasing customer satisfaction (Martinsuo and Ahola, 2022). The Resource-Based View (RBV) approach offers significant contributions in understanding the significance of Relational Capital in the achievement of project success (Patnaik et al., 2022). Organizations that allocate resources towards the development, administration, and utilization of their resource capabilities are more inclined to demonstrate exceptional performance in project implementation, get support from stakeholders, and attain sustained success within a rapidly evolving business landscape (Cooper et al., 2023).

Based on the arguments, it is proposed that:

H8: There is a significant and positive impact of BDA on RC.

H9: There is a significant and positive impact of RC on PS.

The literature above suggests that BDA can impact RC (Vassakis et al., 2023) which can influence PS (Wang et al., 2022). Hence, the following hypothesis is proposed:

H10: RC mediates the relationship between BDA and PS.

2.5. The mediating role of structural capital

An organization's non-human, ethereal assets, such as its systems, processes, patents, trademarks, intellectual property, databases, and other knowledge-based resources, are referred to as SC (Benevene and Cortini, 2010). An organization's knowledge infrastructure facilitates operations and contributes to its overall value. The knowledge that is embedded in an organization's systems and structures but is not linked to a specific individual is structural capital (Chen et al., 2004). Quantifying and measuring SC can be challenging, but organizations need to maintain and grow it to increase their competitiveness and long-term success.

Big data analytics can assist a business in maximizing its structural capital. BDA can identify patterns and trends that can be used to enhance business processes, products, or services and generate new revenue streams (Anshari et al., 2019). BDA and SC can help a company realize its

maximum potential. By utilizing the insights and knowledge from data analysis, businesses can enhance their business processes, improve their products and services, and create new growth and innovation opportunities (Shehzad et al., 2022; Norena-Chavez and Thalassinos, 2023).

The relationship between BDA and SC can be further explained using DCT. By utilizing BDA, businesses can enhance their SC by developing more efficient and effective systems and processes that are better aligned with the requirements of their customers and the market (Al-Khatib, 2022). By utilizing BDA, businesses can enhance their SC and develop more efficient and effective systems and processes that are better aligned with the requirements of their customers and the market (Alkhatib and Valeri, 2022). The application of DCT provides a significant conceptual framework for comprehending the potential impact of incorporating BDA into SC. This integration has the potential to enhance knowledge management, organizational efficiency, and ultimately confer competitive advantages (Khan et al., 2023). Organizations that develop and enhance their dynamic capabilities in utilizing Big Data Analytics (BDA) are more effectively equipped to manage intricate and ever-changing structural obstacles inside the contemporary commercial environment (Gao and Sarwar, 2022).

Regarding project success, structural capital can be crucial in ensuring that a project is completed on time, within budget, and to the desired standard (Ika and Pinto, 2022). For instance, an organization with well-established project management processes and systems is more likely to be able to complete projects than one without these resources (Blomster and Koivumäki, 2022). Based on the arguments, it is proposed that:

H11: There is a significant and positive impact of BDA on SC.

H12: There is a significant and positive impact of SC on PS.

The literature above suggests that BDA can impact SC (Anshari et al., 2019) which can influence PS (Ika and Pinto, 2022). Hence, the following hypothesis is proposed:

H13: SC mediates the relationship between BDA and PS.

2.6. The mediating role of knowledge sharing

The practice of exchanging information, knowledge, skills, or expertise between individuals, teams, departments, or organizations is known as knowledge sharing (Lindblom and Martins, 2022). By providing insights, information, and data that can be used to inform decision-making and enhance performance, BDA can facilitate KS (Zhang et al., 2022). BDA can facilitate dismantling organizational silos and sharing information and expertise across departments and teams (Sleep et al., 2023). By providing a centralized platform for data analysis and sharing, big data analytics can contribute to developing a culture of collaboration and learning in which employees are encouraged to share their knowledge and expertise (SanClements et al., 2022).

The relationship between BDA and KS can be further explained in light of the DCT. BDA can provide businesses with insights and information to help them make better choices, but only if this information is effectively shared throughout the organization, this is where knowledge-sharing occurs (Awan et al., 2022). Firms with a KS culture are better positioned to utilize insights from BDA and use this information to drive performance (Nguyen, 2022). The integration of Big Data

Analytics into knowledge sharing can yield enhanced information distribution, collaboration, and competitive benefits, as elucidated by Dynamic Capability Theory (Horng et al., 2022). Organizations that develop and nurture dynamic capabilities in utilizing big data analytics (BDA) are more effectively positioned to establish a culture that emphasizes the sharing of information and innovation driven by data in the contemporary business environment (Ciasullo et al., 2022).

Projects frequently involve complex tasks requiring various skills and knowledge; effective knowledge sharing can help ensure that all participants can access the information and resources they need to complete and provide the PS (Ahlfänger et al., 2022). By exchanging knowledge, team members can avoid duplicating efforts, gain insight from one another's experiences, and work collaboratively to solve problems and surmount obstacles (Alblas, 2022). This can assist in enhancing work quality and decreasing errors and increasing the project's success. KS can foster teamwork and purpose. Motivated and engaged team members can improve project success by feeling valued and part of a more significant effort (Berraies and Chouiref, 2022).

The relationship between KS and PS can be further explained in light of the RBV. KS improves work and decision-making, creating value, and knowledge sharing helps team members comprehend project needs, improving project success (Marinho and Couto, 2022). In organizations with divisions and communication barriers, knowledge sharing can be uncommon and enhance the project's success (Alves et al., 2022). Organizations can differentiate themselves from competitors and generate a competitive advantage by actively promoting knowledge exchange to improve the project's successful performance (Horng et al., 2022).

Based on the arguments, it is proposed that:

H5: There is a significant and positive impact of BDA on KS.

H6: There is a significant and positive impact of KS on PS.

The literature above suggests that BDA can impact KS (Sleep et al., 2023) which can influence PS (Alblas, 2022). Hence, the following hypothesis is proposed:

H7: KS mediates the relationship between BDA and PS.

2.7. Entrepreneurial leadership and big data analytics

The study of EL was initiated by Cunningham and Lischeron (1991), who defined EL by considering various variables, such as objectives, opportunity generation, empowerment of individuals, preservation of institutional knowledge, and the development of human resource frameworks. EL holds significant importance as it acknowledges the crucial role of people in the entrepreneurial process (Cogliser and Brigham, 2004). Building upon this, Renko et al. (2015) further emphasized that EL involves motivating and directing group members to achieve organizational objectives by identifying and capitalizing on entrepreneurial opportunities. Entrepreneurial leaders are characterized by their imagination, innovation, and risk-taking ability, fostering a work environment that encourages creativity rather than mundane tasks for their employees (Sarabi et al., 2020).

To understand the relationship between BDA and EL, the resource-based view theory can shed light on the matter. Both BDA and EL are considered resources that can offer a competitive

advantage to businesses. The RBV framework elucidates the connection between big data analytics and entrepreneurial leadership by highlighting the significance of rare and valuable resources in establishing sustainable competitive advantages (Grover et al., 2018). Organizations can leverage BDA and EL to discover new business opportunities, develop innovative solutions, and make well-informed decisions based on data-driven insights (Troisi et al., 2020). Hence, it can be postulated that:

H14: There is a positive and significant relationship between BDA and EL.

3. Methodology

3.1. Participants and procedure

The participants in this study were executives employed by IT companies in Peru. To ensure the quality of translations, each questionnaire item underwent both direct and back translation. With the assistance of two professors, the scales were then rephrased in English. The research employed positivistic methods for data collection, utilizing self-reporting questionnaires. The data was gathered from 500 respondents, selected through a combination of non-probabilistic purposive sampling and convenience sampling. A total of 500 questionnaires were distributed, out of which 450 were returned, resulting in a response rate of 90%. After the data was examined, 422 questionnaires were considered usable for analysis. The study's sample consisted of 91.3% male respondents and 8.7% female respondents. The majority of participants fell within the age range of 35 to 39, while 61.6% of them held a bachelor's degree.

3.2. Measures

The scales used in the present study were adapted from existing research. Items were rated on a 5-point Likert scale (1 = "strongly disagree" and 5 = "strongly agree"). BDA was measured by a four-item scale developed by Lin et al. (2022). An example item is, "Our organization has realized the integration of big data in various business processes". The PS was measured by an eight-item scale developed by Aga et al. (2016). Sample items include the project being completed on time and conducted according to the allocated budget. EL was measured by an eight items scale developed by Renko et al. (2015). An example item from the scale is, "My manager wants me to challenge the current ways we do business". A four-item scale developed by Azeem et al. (2021) measured KS. An example of an item is, "In their work, our employees rely on experience, skills, and knowledge". IC contends three variables (Human capital, Relational capital, and Structural Capital) were measured using a scale developed by Hsu and Fang (2009), with four items measuring Human capital, seven counting Structural capital, and four-item measuring Relational capital. All participants were informed of the research objective and signed the informed consent.

4. Data analysis and results

4.1. Measurement model assessment

In the evaluation of the measurement model, the first step involved assessing the factor loadings. While factor loadings higher than 0.70 are preferred, it is common for social science researchers to obtain peripheral loadings below this threshold. Only items with outer loadings between 0.40 and

0.70 would be removed if their exclusion led to an improvement in composite reliability or extracted average variance (AVE) beyond the specified range (Hair et al., 2021). The construct reliability was also evaluated using Cronbach's alpha and composite reliability, and all study constructs demonstrated reliability above the required threshold of 0.70 (Hair et al., 2021). Convergent validity was assessed using Average Variance Extracted (AVE). The results indicated acceptable convergent validity since the AVE values exceeded 0.500 (see **Table 1**). To evaluate discriminant validity, correlations among the latent variables were compared to the square root of AVE and the heterotrait–monotrait correlation ratio (Hair et al.,2021). All values were below the conservative cutoff of 0.85, confirming the presence of discriminant validity. The results for discriminant validity can be found in **Tables 2** and **3**.

Table 1. Construct reliability and validity.

Construct	Item	Outer loadings	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
BDA	BDA1: Our organization often uses big data analytics technology.	0.771	0.764	0.850	0.586
	BDA2:Employees of our organization are frequent users of big data analytics technology.	0.722			
	BDA3:Our organization has realized the integration of big data in various business processes.	0.791			
	BDA:4 Big data-related analysis and prediction capabilities are often used during our business processes.	0.776			
EL	EL1:My manager demonstrates a passion for my work.	0.831	0.882	0.895	0.519
	EL2:My manager has a vision of the future of our business.	0.769			
	EL3:My manager challenges and pushes me to act more innovatively.	0.688			
	EL4:My manager has creative solutions to problems.	0.805			
	EL5:My manager often comes up with radical improvement ideas for the products/services we are selling.	0.757			
	EL6:My manager often comes up with ideas of new products/services that we could sell.	0.603			
	EL7:My manager is ready to take risks.	0.659			
	EL8:My manager wants me to challenge the current ways we do business.	0.616			
HC	HC1: The level of employee empowerment is high in my company.	0.788	0.726	0.846	0.647
	HC2: The employees in my company possess excellent professional skills.	0.813			
	HC3:The company provides well-designed training programs.	0.847			
	HC4: The employees of my company have unique and new ideas.	0.750			

Table 1. (Continued).

Construct	Item	Outer loadings	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
KS	KS1:Our employees exchange knowledge with their co-workers.	0.637	0.824	0.886	0.663
	KS2:In their work, our employees rely on experience, skills, and knowledge.	0.859			
	KS3:In the relationship, we frequently adjust our shared understanding of end-user needs, preferences, and behaviors.	0.873			
	KS4: Our companies exchange information related to changes in the technology of the focal products.	0.863			
PS	PS1:The project was successful.	0.709	0.826	0.870	0.489
	PS2:The project has satisfactorily met the budget goals.	0.695			
	PS3:The project has satisfactorily met the schedule goals.	0.715			
	PS4:The project has satisfactorily delivered the required outputs (i.e. fulfilled its requisites).	0.632			
	PS5:Project's outputs have supported the business to produce the expected outcomes.	0.74			
	PS6:Undesired outcomes were managed and avoided.	0.735			
	PS7:The project has provided the expected return on investment.	0.664			
RC	PS8:The project's outcomes adhered to the outcomes planned in the business case.	0.710	0.753	0.842	0.572
	RC2:The company has many excellent suppliers.	0.742			
	RC3:The market that my company is in has the potential to grow.	0.792			
	RC4:The company has solid strategic alliances	0.78			
SC	SC1:The company emphasizes IT investment.	0.768	0.855	0.890	0.538
	SC2:The company is willing to invest in business development.	0.774			
	SC3:The company has an easily-accessible information system.	0.784			
	SC4:The company invests a high proportion of its money in R&D.	0.756			
	SC5:The company invests a high proportion of its money in patent maintenance.	0.733			
	SC6:The company emphasizes new market development investment.	0.701			
	SC7:The company has a high proportion of R&D employees.	0.603			

Table 2. Fornell-larcker criterion.

	BDA	EL	HC	KS	PS	RC	SC
BDA	0.765						
EL	0.248	0.721					
HC	0.484	0.237	0.804				
KS	0.364	0.425	0.642	0.814			
PS	0.499	0.376	0.381	0.413	0.699		
RC	0.341	0.432	0.387	0.473	0.512	0.757	
SC	0.372	0.426	0.593	0.660	0.510	0.587	0.734

Table 3. Heterotrait-monotrait ratio (HTMT).

HTMT	BDA	EL	HC	KS	PS	RC	SC
BDA							
EL	0.237						
HC	0.649	0.261					
KS	0.446	0.46	0.822				
PS	0.615	0.441	0.487	0.505			
RC	0.439	0.536	0.533	0.612	0.633		
SC	0.457	0.463	0.753	0.786	0.601	0.751	

4.2. Structural model

Next, the structural model is assessed to substantiate the proposed relationships. Assessing R2, the results reveal that 6.2% of BDA accounted for EL. 11.6% change in RC can be accounted for BDA, 13.9% change in SC can be accounted for BSA.23.2% change in HC can be accounted for BDA, and 13.3% change in KS can be accounted for BDA. 41.8% of the change in PS can be accounted for BDA, RC, SC, HC, and KS. A Q2 above 0 shows that the model has predictive relevance. The results show that there is significance in the prediction of the constructs (see **Table 4**).

Next, the hypotheses are tested. The results revealed that BDA has a significant impact on PS (β = 0.330, t = 6.060, p = 0.000). Hence, H1 was supported. The results revealed that BDA has a significant impact on HC (β = 0.484, t = 12.376, p = 0.000). Hence, H2 was supported. The results revealed that HC hasn't a significant impact on PS (β = –0.046, t = 0.898, p = 0.185). Hence, H3 wasn't supported. The results revealed that BDA has a significant impact on KS (β = 0.364, t = 7.097, p = 0.000). Hence, H5 was supported. The results revealed that KS hasn't a significant impact on PS (β = 0.047, t = 0.707, p = 0.000). Hence, H6 wasn't supported. The results revealed that BDA has a significant impact on RC (β = 0.341, t = 6.988, p = 0.000). Hence, H8 was supported. The results revealed that RC has a significant impact on PS (β = 0.259, t = 4.862, p = 0.000). Hence, H9 was supported. The results revealed that BDA has a significant impact on SC (β = 0.372, t = 8.330, p = 0.000). Hence, H11 was supported. The results revealed that SC has a significant impact on PS (β = 0.232, t = 4.210, p = 0.000). Hence, H12 was supported. The results revealed that EL has a significant impact on BDA (β = 0.248, t = 6.508, p = 0.000). Hence, H14 was supported.

Table 4. Hypotheses results and predictive relevance.

	β	SD	T statistics	P values
BDA -> PS (H1)	0.330	0.054	6.060	0.000
BDA -> HC (H2)	0.484	0.039	12.376	0.000
HC -> PS (H3)	–0.046	0.052	0.898	0.185
BDA -> KS (H5)	0.364	0.051	7.097	0.000
KS -> PS (H6)	0.047	0.067	0.707	0.240
BDA -> RC (H8)	0.341	0.049	6.988	0.000
RC -> PS (H9)	0.259	0.053	4.862	0.000
BDA -> SC (H11)	0.372	0.045	8.330	0.000
SC -> PS (H12)	0.232	0.055	4.210	0.000
EL -> BDA (H14)	0.248	0.038	6.508	0.000
Q^2predict				
BDA	0.050			
HC	0.052			
KS	0.069			
PS	0.076			
RC	0.066			
SC	0.069			

4.3. Mediation analysis

The results revealed an insignificant indirect effect of BDA on PS through HC (β = –0.222, t = 0.887, p = 0.188). Hence H4 wasn't supported. The results revealed an insignificant indirect effect of BDA on PS through KS (β = 0.017, t = 0.692, p = 0.244). Hence H7 wasn't supported. RC was found to have a significant complementary mediating role in the relationship between BDA and PS (β = 0.088, t = 4.105, p = 0.000). Hence, H10 was supported. SC was found to have a significant complementary mediating role in the relationship between BDA and PS (β = 0.086, t = 3.570, p = 0.000). Hence, H13 was supported. Mediation results are presented in **Table 5.**

Table 5. Mediation analysis.

	β	SD	T statistics	P values
Total Effect				
BDA ->PS	0.500		10.815	0.000
Direct Effect				
BDA ->PS	0.330		6.060	0.000
Hypotheses				
BDA -> HC -> PS (H4)	–0.022	0.025	0.887	0.188
BDA -> KS -> PS (H7)	0.017	0.025	0.692	0.244
BDA -> RC -> PS (H10)	0.088	0.022	4.105	0.000
BDA -> SC -> PS (H13)	0.086	0.024	3.570	0.000

5. Discussion and conclusion

This study examines how BDA influences project success by considering its impact on HC, KS, RC, and SC. The findings indicate a positive and significant direct effect of BDA on project success. These results align with previous research, which has also shown the significant influence of BDA on project success (Ahmed et al., 2022). The outcomes lend support to the perspective of the Resource-Based View (RBV) theory, as BDA emerges as a valuable asset for businesses, enabling them to accumulate and analyze vast amounts of data to make more informed decisions. Through the utilization of BDA, businesses can gain valuable insights into customer behavior, market trends, and other essential factors that contribute to improved project decision-making, subsequently enhancing project success (Zhang et al., 2022).

This study found that BDA had a significant and positive impact on HC. The results supplement previous research on the assumption that BDA can help to increase HC (Moreno et al., 2022; Batko and Ślęzak, 2022). The results support the DCT; for businesses to utilize BDA effectively, HC must have the requisite technical skills and the ability to interpret and implement the insights generated by the data (Wang et al., 2018). To leverage BDA effectively, businesses must develop both technical and HC; with this, firms will ensure the ability to adapt to changes in the environment, including changes in technology and market conditions (AlNuaimi et al., 2021).

The results revealed that HC hasn't a significant impact on PS. The results contradict previous research on the assumption that HC can help to increase PS (Singh et al., 2022; Civera et al., 2022). The results don't support RBV; one possible explanation is that in a complex and rapidly changing business environment, it is conceivable that HC alone is insufficient to promote PS (Young and Poon, 2013). Another possible explanation is that depending on the specific context and available supplementary resources, the effect of HC on PS may vary (Belout and Gauvreau, 2004).

This study found that BDA has a significant and positive impact on KS. The results supplement previous research on the assumption that BDA can help to increase KS (Sleep et al., 2023; SanClements et al., 2023). The results support the DCT, by facilitating the exchange of information across departments and teams, BDA can help organizations develop knowledge-sharing capabilities. BDA can comprehensively comprehend organizational processes by collecting and analyzing data from multiple sources, enabling employees to share knowledge and collaborate more effectively.

This study found that KS hasn't a significant and positive impact on PS (H6). The results contradict previous research on the assumption that KS can help to increase PS (Marinho and Couto, 2022; Berriaies and Chouiref, 2022). The results don't support RBV; one possible explanation is conceivable that KS alone will not suffice to promote PS (Karagoz et al., 2020). KS may require additional resources, which can facilitate employee collaboration and knowledge sharing. Another possible explanation is that resources (KS) and (PS) are context-dependent and depend on their complementarity with other resources (Imam and Zaheer, 2021).

This study found that BDA has a positive and significant impact on RC. The results supplement previous research on the assumption that BDA can help to increase RC (Zarezadeh et al., 2022). The results support the DCT when applied to big data analytics and relational capital, dynamic capability theory suggests that organizations need to learn how to use big data analytics to leverage their relational capital to build value and competitive advantage (Horng et al., 2022). This means that the

organization needs to learn new skills, processes, and technologies to collect, analyze, and act on big and varied data sets (Cetindamar et al., 2022).

This study found that RC has a positive and significant impact on PS. The results supplement previous research on the assumption that RC can help to increase PS (Kucharska, 2022). The results support the RBV, by underscoring the significance of unique and valuable resources and skills, one can strengthen the link between relational capital and project success (Itani et al., 2023. Relational capital tends to be constituted of difficult-to-imitate, complex forms of intellectual capital that influence project success (Kucharska, 2022).

This study found that BDA has a significant and positive impact on SC. The results supplement previous research on the assumption that BDA can help to increase SC (Dwivedi et al., 2022). The results support the DCT; companies can obtain new insights and identify opportunities for innovation and improvement by utilizing big data analytics (Al-khatib, 2022). These insights can be used to alter and innovate the firm's structural capital, allowing it to more effectively leverage its resources and capabilities to accomplish its goals (Alkhatib and Valeri, 2022).

This study found that SC has a significant and positive impact on PS. The results supplement previous research on the assumption that SC can help to increase PS (Ika and Pinto, 2022). Structural capital facilitates the standardization of processes and procedures, thereby increasing their efficiency and effectiveness, by implementing standardized methods, organizations can reduce the likelihood of errors and delays during project execution, resulting in better project outcomes (Wang et al., 2021). Structural capital can facilitate knowledge sharing and collaboration among team members, facilitating the transfer of organizational knowledge and best practices, by exchanging knowledge and best practices, team members can avoid errors and make more informed decisions, resulting in enhanced project outcomes (Yu et al., 2021).

The results revealed that EL has a positive and significant impact on BDA. The results supplement previous research on the assumption that EL can help to increase BDA (Cogliser and Brigham, 2004). The results support the RBV, which can clarify the relationship between entrepreneurial leadership and big data analytics by emphasizing the significance of exceptional and valuable resources and skills (Grover et al., 2018). In this context, big data analytics can be viewed as a unique and valuable asset contributing to a company's competitive advantage (Troisi et al., 2020). Similarly, entrepreneurial leadership can be viewed as a competency that enables a company to effectively identify and pursue new opportunities and innovations.

The results reveal that HC doesn't significantly mediate the relationship between BDA and PS. The results reveal that KS doesn't significantly mediate the relationship between BDA and PS (H7). RC was found to have a mediating role in the relationship between BDA and PS (H10). The results support the argument that there is a causal chain of relationships where BDA leads to improved RC (Horng et al.,2022) that can help attain PS (Kucharska, 2022). This further explains the mechanism of impact through which BDA can improve PS.

The results reveal that SC has a significant mediating role in the relationship between BDA and PS. The results support the argument that there is a causal chain of relationships where BDA leads to improved SC (Dwivedi et al., 2022) that can help attain a successful project (Hetemi et al.,2022). This shows that the relationship of BDA with PS is not direct but indirect, where the influence of

BDA on PS is passing through SC.

5.1. Conclusions

This study examined the prospective impact of BDA on project success (PS) in small and medium-sized IT companies in Peru, as well as the underlying psychological mechanisms at play. This study found that knowledge sharing (KS) and human capital (HC) do not explain the relationship between BDA and PS. However, it was determined that relational capital (RC) and social capital (SC) functioned as significant mediators between BDA and PS. These findings highlight the significance of utilizing relational and social capital as crucial psychological mechanisms for implementing big data analytics to promote project success. Additional research is required to comprehend the nuances of these relationships fully and to develop more targeted strategies for using BDA to promote the success of small and medium-sized enterprises.

5.2. Theoretical implications

This study utilizes the Resource-Based View (RBV) theory and Dynamic Capability Theory (DCT) to enhance our theoretical understanding of how BDA impacts Intellectual Capital (IC), Knowledge Sharing (KS), and ultimately maximizes Project Success (PS) in the context of IT projects. By acknowledging the interdependence of these resources, the influence of BDA on PS was assessed and analyzed using a dataset from the IT industry, with potential applicability to other industries and sectors to further validate the relationship. Furthermore, the findings provide empirical evidence supporting the advantages of BDA in enhancing team outcomes and project performance (Lutfi et al., 2023). This research study aligns with previous research, affirming that BDA significantly improves team outcomes (Behl et al., 2022). In the context of businesses in developing nations like Peru and others, the implementation of BDA is still in its early stages. In such circumstances, organizations' management may be hesitant to invest in technological initiatives due to unawareness of the long-term benefits for both the organization and society. Building upon the research's findings, future investigations can focus on a sub-dimensional level of BDA, identifying the essential components and assets that project managers and team members should prioritize when dealing with vast amounts of data to drive project operations toward success (Ahmed et al., 2022). This study offers a foundation for future research, shedding light on crucial aspects that contribute to successful BDA implementation and its impact on project outcomes.

5.3. Managerial implications

The implications of this research are significant for project managers, IT managers, project coordinators, and policymakers who aim to enhance project performance, as well as Resource Capital (RC) and Structural Capital (SC) through the implementation of BDA. To foster RC and SC, effective project management methods, procedures, and contemporary standards and protocols must be put into practice. Integrating BDA approaches with strategic business objectives should be prioritized by project managers to enhance organizational performance and overall Project Success (PS). Furthermore, this study acknowledges the relevance of resource availability and appropriate utilization, including BDA, as critical factors for the success of initiatives and gaining a competitive advantage, aligning with the existing literature. Nevertheless, it emphasizes the need for greater focus on developing strategic-level policies at the organizational level, facilitating the optimal use of BDA throughout project planning and execution to foster RC and SC effectively.

6. Limitations and future research directions

This cross-sectional study was limited to the IT industry in Peru from a geographical standpoint. In the future, various industrial sectors could potentially adopt a more global perspective. To further advance the understanding of how BDA, RC, and SC influence different project types and industrial sectors, longitudinal research could be conducted. Such research would examine the impact of team outcomes on various project phases, ranging from the conceptual stage to final delivery and handover. Furthermore, the quality of RC and SC can be studied in a controlled environment, both with and without the utilization of BDA. Additionally, examining the impact of analytics-based team RC and SC with a larger sample size would provide valuable insights. Future research might also explore additional mediating variables that can shed light on the mechanisms through which BDA affects Project Success (PS). Lastly, investigating moderating variables, such as alternative leadership styles, could help determine how the relationships proposed in this study can be strengthened or weakened under specific conditions. By addressing these areas, further research can enhance the understanding of the subject and contribute to a more comprehensive knowledge base.

Author Contributions

Conceptualisation, DNC; Methodology, DNC, ET; Validation, DNC; Formal analysis, DNC; Investigation, DNC; Resources, DNC; Writing the original manuscript, DNC, ET; Writing-Reviewing and Editing, DNC, ET; All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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