Role of digital leadership, digital technologies and dynamic capabilities to influence big data analytical capabilities for data driven decision-making

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Doctoral Thesis Summary

Role of digital leadership, digital technologies and dynamic capabilities to influence big data analytical capabilities for data driven decision-making

Role digitálního vedení, digitálních technologií a dynamických schopností při ovlivňování analytických schopností velkých dat pro rozhodování založené na datech

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Klíčová slova: *digitální vedení, schopnosti, analýza velkých dat, rozhodování o velkých datech, dynamické zobrazení schopností.*

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ABSTRACT

Study offers a framework to enhance big data analytical capabilities for data driven decision making through digital leadership and digital capabilities with organizational oriented (digital strategic planning, digital departmental collaboration and top management commitment), employee oriented (digital social capital and digital literacy) and technological oriented (industrial internet of things) through the theoretical lens of dynamic capability view.

Several studies has analysed the transformation process of the firm and all of them has highlighted the same problem or barriers in transformation of the firms. These barriers are organizational oriented, human oriented and technological oriented. Furthermore, these studies are conceptualize through qualitative studies but not even a single empirical or quantitative study has conducted that discusses these factors simultaneously.

Current study identifies the given gap by discussing the organizational, human and technological factors all together with empirical or quantitative analysis to increase the generalizability of the study. Current study discusses these factors with a novelty and in terms of today's needs. Organizational capabilities includes digital strategic planning, digital departmental collaboration and top management commitment. Human capabilities or factors includes digital social capital and digital literacy. Whereas, technological capability or factor includes industrial internet of things.

Data collected through survey questioners from 277 employees working in chemical sectors of Pakistan at decision making positions in Pakistan. Study contribute towards dynamic capability view that which category of capabilities from organization, human and technological is more important for implementation and usage of big data so that organization can focus more on building and enhancing such capabilities.

ABSTRAKT

Studie vymezuje rámec pro optimalizaci analytických schopností velkých dat pro rozhodování řízené daty prostřednictvím digitálního vedení a digitálních schopností s orientací na organizaci (digitální strategické plánování, digitální spolupráce oddělení a podpora vrcholového managementu), zaměstnance (digitální sociální kapitál a digitální gramotnost) a technologie (průmyslový internet věcí) vymezenou teoretickou optikou pohledu na dynamické schopnosti.

Vícero studií analyzovalo proces transformace firmy a všechny poukázaly na stejný problém nebo bariéry v transformaci firem. Tyto bariéry jsou orientované na organizaci, na člověka a na technologie. Kromě toho jsou tyto studie konceptualizovány prostřednictvím kvalitativních studií, ale nebyla provedena ani jediná empirická nebo kvantitativní studie, která by tyto faktory probírala současně.

Současná studie identifikuje uvedenou mezeru diskusí o organizačních, lidských a technologických faktorech společně s empirickou nebo kvantitativní analýzou, s cílem zobecnění závěrů studie. Současná studie pojednává o těchto faktorech novátorsky a z hlediska dnešních potřeb. Organizační schopnosti zahrnují digitální strategické plánování, digitální spolupráci oddělení a podporu vrcholového managementu. Lidské schopnosti nebo faktory zahrnují digitální sociální kapitál a digitální gramotnost. Zároveň technologická schopnost nebo faktor zahrňují průmyslový internet věcí.

Údaje byli shromážděné na základě dotazníkového průzkumu od 277 zaměstnanců pracujících v chemických sektorech Pákistánu na rozhodovacích pozicích. Studie přispívá k dynamickému pohledu na schopnosti, která kategorie schopností z organizačních, lidských a technologických je důležitější pro implementaci a využití velkých dat tak, aby se organizace mohla více soustředit na budování a rozšiřování uvedených schopností

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS USED

DL   Digital Leader

DDC   Digital departmental collaboration

TMC   Top management commitment

DSC   Digital social capital

DLIT   Digital literacy

IOT   Internet of things

IIOT   Industrial Internet of things

BDAC's   Big data analytical capabilities

BDA   Big data analytics

DDDM   Data driven decision making

RBV   Resource based view

KBV   Knowledge based view

1. INTRODUCTION

Improvements in digital technologies is already an opportunity for the organisations ready for digital future and risk to those not recognizing the necessity to get ready for digital transformation (Weill & Woerner, 2018). In the contemporary digital landscape, the imperative for survival increasingly hinges on the implementation of digital metamorphoses facilitated by technologies like big data analytics (BDA), cloud computing, and the internet of things (IoTs). (Shah, 2022). Managers are under pressure to adapt these technologies for value creation to achieve competitive advantage or to even survive in the industry (Ghosh, Hughes, Hodgkinson, & Hughes, 2021; Lee, Suh, Roy, & Baucus, 2019). Major computer service supplier, America has attained thirteen per cent growth for the year 2020 and share for cloud computing and data storage exports in this growth is twenty five per cent that represents the outcomes of remote working trend and industrial digitalization influenced by covid-19 pandemic (Klos, Spieth, Clauss, & Klusmann, 2021; WTO, 2021). Disruption in global supply chain was also observed and being faced globally due to covid-19 pandemic and organizations are trying to cope up with all these disruption by leveraging their digital technologies (Ivanov, Dolgui, & Sokolov, 2019; Sharma et al., 2020). McAfee, Brynjolfsson, Davenport, Patil, and Barton (2012) also claimed that in future successful organization will be those organizations who will adopt big data solution.

1.1   Current state of the issues dealt

Digital transformation is the dynamic change in business orientation of organizations which must be a constant process in daily organizational life due to nonstop development in digital technologies (Warner & Wäger, 2019; Yoo, Boland Jr, Lyytinen, & Majchrzak, 2012). Scholars perceive very little chances of digital transformation success (Ghosh et al., 2021; Hugh Bachmann, Keith Beattie, Paolo Stefanini, & Welchman, 2021). It is mainly because specific strategic level and operational level capabilities are required (F. Li, 2020; Sestino, Prete, Piper, & Guido, 2020). While initiating digital transformation organizations face several challenges that exist as obstacles towards digital transformation and essential to be addressed. For instance, integration of IT strategy and business strategy (Mithas, Tafti, & Mitchell, 2013) (Borges, Laurindo, Spínola, Gonçalves, & Mattos, 2021; Tijan, Jović, Aksentijević, & Pucihar, 2021), Insufficient cooperation among stakeholders to advance digital technologies (Tijan et al., 2021). Current study recommends the term digital

departmental collaboration (DDC). Whereas, Surbakti, Wang, Indulska, and Sadiq (2020) has Highlighted the significance of interdepartmental collaboration in the efficient use of big data for data-driven decision-making (DDDM) and putting into practice of new digital technologies (Setia, Setia, Venkatesh, & Joglekar, 2013) like internet of things (IOT). In the context of big data, Surbakti et al. (2020) emphasize that, in addition to top management commitment (TMC), there is another critical factor that should not be overlooked when aiming to improve the worth of decision-making through big data analytics (BDA). All these challenges make it crucial to investigate that how industrial managers should initiate and achieve strategic digital transformation in organizations (Ghosh et al., 2021).

1.2   Research problem

Traditional firms existence were already under threat due to advancement in technology (Weill & Woerner, 2018). Big data, cloud computing, data analytics and IOT are pressurizing senior industrial managers to transform their traditional firms or partially digitized firms into fully digitize firms (Ghosh et al., 2021; Lee et al., 2019) but there are some barrier in implementation and usage of such technologies like big data. Lee et al. (2019) and Surbakti et al. (2020) identified three categories of barrier in implementation and usage of digital technologies like big data which are organizational barrier, human oriented barrier and technological barriers. Thus, senior industrial managers are confused that how to initiate or achieve strategic digital transformation initiatives in their firm (Ghosh et al., 2021).

1.3   Research aim

Current study aim's is to provide a framework or mechanism for enhancing organizational, human, and technological capabilities to boost BDAC's for data driven decision making (DDDM).

1.4   Research question

Changing business orientation from traditional way of decision making to DDDM is not about technology, it is about the strategy that how leader capitalize on it (Warner & Wäger, 2019). Leader with digitalization experience and skills can tackle these challenges such as DL (Klos et al., 2021). Regrettably, there is not enough or sufficient research is conducted that how organizational capabilities (DSP, DDC and TMC), human capabilities (SSC and DL), and technological capability (IIOT) could be enhance through DL for enhanced BDAC and DDDM. This research gap provide motivation to answer the research

question for current study that how DL will enhance organizational capabilities, human capabilities and technological capabilities to boost BDAC's for DDDM.

1.5   Research objectives

Providing a clear guideline for capability development for digital transformation by applying BDAC's for DDDM quality is the main research objective of current study.

Prior studies on capability development for data-driven decision making (BDA) have generally focused on leadership, this study offers a more targeted approach to leadership. i.e. DL. Furthermore, roles of organizational capabilities such as DSP and inter departmental collaboration, human capabilities like DSC and DLIT. Furthermore, technological capabilities like IIOT in the nexus of DL and BDA driven decision making quality is underexplored. Therefore, based on above research problem, study aim and above discussions, current study has the following objectives.

1. To investigate the effect of digital leadership on big data analytical capabilities.
2. To investigate the effect of digital leadership on digital strategic planning.
3. To investigate the effect of digital leadership on digital departmental collaboration.
4. To investigate the effect of digital leadership on top management commitment.
5. To investigate the effect of digital leadership on digital social capital.
6. To investigate the effect of digital leadership on digital literacy.
7. To investigate the effect of digital leadership on industrial internet of things.
8. To investigate the mediating role of digital strategic planning on the relationship of digital leadership and big data analytical capabilities.
9. To investigate the mediating role of digital departmental collaboration on the relationship of digital leadership and big data analytical capabilities.
10. To investigate the mediating role of top management commitment on the relationship of digital leadership and big data analytical capabilities.
11. To investigate the mediating role of digital social capital on the relationship of digital leadership and big data analytical capabilities.
12. To investigate the mediating role of digital literacy on the relationship of digital leadership and big data analytical capabilities.

13. To investigate the mediating role of industrial internet of things on the relationship of digital leadership and big data analytical capabilities.
14. To investigate the effect of big data analytical capabilities on data driven decision making.

2. LITERATURE REVIEW

2.1 Dynamic capability view

DCs refer to the ability to detect potential threats and opportunities, capitalize on opportunities, and adapt to changes in the environment (Teece, 20078) i.e. digital transformation in the context of this study. (Warner & Wäger, 2019). Warner and Wäger (2019) delineate three sub-capabilities of digital transformation capability: navigating the innovation system, redesigning internal structures, and enhancing digital maturity. Implementing big data in organizations through organizational capabilities such as DSP, DDC, and TMC hinges on the sub-capability of digital transformation known as redesigning internal structures. This is crucial for realizing the full potential of strategic change (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Karimi & Walter, 2016; Teece & Linden, 2017). Relationship among DCs, strategy and business model is well established (Achtenhagen, Melin, & Naldi, 2013; DaSilva & Trkman, 2014; Teece, 2018; Velu, 2017). Casadesus-Masanell and Ricart (2010) argued that it is strategy, which reflects organizational business model, and when an organization is undergoing digital transformation of its business model, that is one of the three capabilities within the sub-capability of redesigning internal structure, it should poses a digital strategy. Whereas, DaSilva and Trkman (2014) argued that strategy revolves around constructing DC to effectively address both current and future radical and dramatic situations. It is evident from the arguments that strategy should be tailored to fit the firm's business model. Companies undergoing digital transformation should be guided through DSP. Doz and Kosonen (2010) proposed a variety of actions, such as increasing the sensitivity of strategic planning and enhancing resource fluidity, to embed strategic agility into the renewal and transformation of a firm's business model, thereby accelerating the process.

Navigating innovation ecosystems which is one of the sub-capability of digital transforming capability focused on digital ecosystem (Warner & Wäger, 2019). This ecosystem is constantly evolving and mainly depends upon mature IIOT in current study context. Current study suggests the transformation of business

model, which means a transition from traditional way of value creation to digitalize way of value creation through BDAC's and it is mainly depends upon mature IOT (Warner & Wäger, 2019). Warner and Wäger (2019) has identified a number of organizations who has reshaped their business model using IOT platform and they also suggested the DL for any digital transformation based on dynamic capability theory.

Improving digital maturity of employee is among the sub-capability of digital transforming capability under dynamic capability theory (Warner & Wäger, 2019). Current study suggest that by incorporating DSC in organizational culture, DL can enhance the digital maturity of the employees so that they get gathered information from the multiple sources regarding industry for applying that information into their BDAC's for more sophisticated decision making.

Leadership lacking digital experience is seen as a major obstacle to the digital transformation of business processes (El Sawy, Kræmmergaard, Amsinck, & Vinther, 2016). DL possesses the experience and skillset necessary for digital transformation (Weill & Woerner, 2018). Engagement of a chief digital officer is also an element of sub-capability redesigning internal structure for digital transforming capabilities (Warner and Wäger, 2019). DL improves all factors, including DSP, which reflects the firm's commitment to DDDM, DDC, and TMC, as the last factor of the sub-capability of redesigning internal structure is designing a team-based structure. The present study focuses on digital transformation capability, which involves the shift from a traditional business model to a digital one. This is achieved through the sub-capability of redesigning internal structure, led by a digitally experienced leader (DL). This leader formulates a DSP for DDDM by implementing big data solutions. Additionally, they design a team-based structure through DDC and TMC.

2.2 Digital leadership and big data analytical capabilities

In the digital age, a leader must possess a transformative vision, DLIT as well as general leadership abilities such as team building and collaboration. (Kane, Phillips, Copulsky, & Andrus, 2019). Leaders should take the initiative to foster collaboration among employees and facilitate forward-thinking by leveraging information technology (Anak Agung Sagung & Sri Darma, 2020). Anak Agung Sagung and Sri Darma (2020) and Kane et al. (2019) claimed that these characteristic belongs to DL. The implementation and progress of BDAC's are closely linked with decision-making culture and IT leadership. (Grover, Chiang, Liang, & Zhang, 2018). "BDAC is defined as the ability of the firm to capture

and analyse data toward the generation of insights, by effectively deploying its data, technology, and talent through firm-wide processes, roles and structures" (Gupta & George, 2016; Kiron, Prentice, & Ferguson, 2014; Wamba et al., 2017). Kane et al. (2019) asserts that technology comprehension is the top three skills that DL should hold. This indicates that IT leadership is considered one of the characteristics of a DL. BDACs, rooted in decision-making culture and led by a DL, are expensive and difficult to replicate (Grover et al., 2018). The authors previously noted that 70% of transformations fail, McAfee et al. (2012) emphasizing that a lack of appropriate leadership is a primary contributing factor. Leadership that possesses a clear BDA strategy is more likely to achieve success (Grover et al., 2018). In a case study by Dremel, Wulf, Herterich, Waizmann, and Brenner (2017), the example of a car manufacturing company, AUDI AG, is discussed. A chief digital officer led the transformation of this company. whereas Janssen, van der Voort, and Wahyudi (2017) discusses the case of implementing BDA in a Dutch tax organization, a process that was spearheaded by directors. Both the chief digital officer and the directors share the characteristic of being DL. Grover et al. (2018) contend that IT leadership, which falls under the umbrella of DL (Kane et al., 2019), is presented with outstanding opportunities to invest in BDA. The dynamic capability perspective also suggests that organizations can create or reconfigure their existing capabilities or competencies to effectively address environmental threats (Teece, Pisano, & Shuen, 1997) and it is already discussed that DL step forward to frontward routing by utilizing information technology (Anak Agung Sagung & Sri Darma, 2020). Furthermore hiring a DL is also suggested by Warner and Wäger (2019) who pointed out the importance of the DL hiring under the sub-capability redesigning the internal structure. Based on these arguments current study proposed below hypothesis.

H$_1$: Digital leadership (DL) has a positive effect on big data analytical capabilities (BDAC's).

2.3 Digital leadership and digital strategic planning

DL involves leveraging resources to enhance or add value to our activities, reflecting the strategic mind-set of the leader (Anak Agung Sagung & Sri Darma, 2020). The strategic mind-set embodies the strategic planning that the leader envisions for the organization, detailing where we are currently and where we aim to be in the future. Kane et al. (2019) DL possesses a digitalized and transformative vision, enabling the implementation of digital technologies like big data for DDDM through a DSP. Understanding digital future scenarios and

devising a digital strategy is also aided by the DC perspective, particularly through its sub-capability of digital scenario planning (Warner & Wäger, 2019). Persson (2020) also claimed that a clear vision is crucial for developing a robust strategic plan and DL possess a digitalized vision to create a DSP that enhances BDAC's. Base on these discussion current study define DL as "a portfolio of digital, business and strategic leadership skills (interpersonal and intrapersonal skills to create value through driving action, strategic mind-set and decision making)" (Benitez, Arenas, Castillo, & Esteves, 2022). DL are also regarded as crucial for the implementation of digital technologies such as BDA and DDDM by integrating information technology with the business strategy of the firm. (Benitez et al., 2022). Based on these arguments current study proposed below hypothesis.

H_2: Digital leadership (DL) has a positive impact on digital strategic planning (DSP).

2.4   Digital leadership, digital strategic planning and big data analytical capabilities

Strategy may influence capabilities (Benitez et al., 2022). The capability of BDA and the strategic business plan can be aligned together. (Akter, Wamba, Gunasekaran, Dubey, & Childe, 2016). The alignment of strategic planning and BDAC's is contingent upon having a visionary leader. (Akter et al., 2016) because A vision serves as the foundation for strategic planning (Persson, 2020) In the current study scenario, the leader possesses a digital vision, which forms the basis for the DSP. A digital-centric strategic planning approach, rooted in a digitalized vision, will have a positive impact on BDAC's. This is because the DSP of the firm will be designed in alignment with the BDAC's. McAfee et al. (2012) also emphasized that the success of companies does not hinge on the size of the data or its quality, but rather on having clear goals. This is because the power of big data cannot replace the necessity for vision. They also emphasize the importance of aligning or synchronizing strategies with BDAC's. The more synchronized the BDAC's are with the business strategies, the greater the synergy among different functional units, leading to a positive impact on desired outcomes. (BDA capabilities) (McAfee et al., 2012).

The discourse on the interplay between BDAC's and DL as well as DSP has been comprehensively discusses in the preceding discussion. There is limited literature that delves into the mediating role of DSP in the relationship between DL and DSP. The digital sensing capability, particularly through its sub-

capability of Digital Scenario Planning, empowers DL to craft a DSP. Additionally, another sub-capability of Digital Sensing, referred to as Digital Mind Crafting, enables DL to foster a digital mindset within the organization (Warner & Wäger, 2019) by matching its DSP and BDA capabilities (McAfee et al., 2012). The dynamic capability perspective, particularly through its sub-capability of redesigning internal structure, supports the notion that organizations should hire a DL for the implementation of digital technologies such as Big Data for DDDM (Warner & Wäger, 2019). As previously elaborated, the DSP process is anticipated to exert a discernible impact on the development and enhancement of BDAC's. Benitez et al. (2022) posit that strategic initiatives possess the potential to significantly shape and enhance organizational capabilities, particularly when these strategies are meticulously aligned with the organizational capabilities (Akter et al., 2016). DL, through their transformative vision and IT leadership skills (Kane et al., 2019), will establish alignment between Digital Strategy Planning (DSP) and Big Data Analytics (BDA) capabilities. This alignment will enable DSP to effectively influence BDA capabilities. Based on these arguments current study proposed below hypothesis.

H_3: Digital strategic planning (DSP) mediates the relationship among digital leadership (DL) and big data analytical capabilities (BDAC's).

2.5 Digital leadership and digital departmental collaboration

The current study is grounded in the sub-capability of redesigning internal structure, which is a critical aspect of the broader digital transformation capability. A team-based structure is one of the elements of redesigning the internal structure that supports DDC. Oberer and Erkollar (2018) Oberer and Erkollar (2018) advocate that in the progressive phase of Industry 4.0, characterized by the adoption of novel technologies, the cultivation of cooperation and collaboration is essential, facilitated through digital platforms like cloud computing. The pivotal role of DLs is crucial in the development of DDC through its collaborative attributes (Kane et al., 2019). DDC means working relation between departments within a company through digital platform to enhance BDA capabilities for quality DDDM. Janowski, Estevez, and Baguma (2018) Shariq conducted a case study and identified several factors that impact departmental collaboration, such as facilitating a platform for stakeholders to collaborate and integrating new technologies to enhance departmental collaboration. In the present study, these two factors are collectively analyzed under the framework of Departmental Digital Collaboration (DDC). Legner et al. (2017) posited that the organizational IT functions ought to undergo a transformative process, characterized by the adoption of new internal

organizational structures, alongside novel modes of collaboration and alignment with business departments. The digitalization process is facilitated by the convergence of several IT megatrends, including big data, cloud computing, mobile technology, social media, and smart technologies. To successfully digitalize their operations, organizations must undergo a socio-technical transformation that impacts their business processes (Legner et al., 2017). The rising demand for digital technologies, such as cloud computing, places significant pressure on organizational leaders to adapt and integrate these technologies effectively (Legner et al., 2017). Warner and Wäger (2019) argue that in any given industry, the introduction of a platform is typically spearheaded by the leading organization within that industry. The same phenomenon can also be observed within organizations. If a digital platform is being considered, an organizational leader, who in the context of the current study is referred to as the DL, would typically lead the orchestration of that platform. Wasono and Furinto (2018) claim that DL is essentially a fusion of leadership skills and digital capabilities, aimed at optimizing the outcomes of digital technologies. DL is essentially a fusion of leadership skills and digital capabilities, aimed at optimizing the outcomes of digital technologies. DL's innovative vision, networking intelligence, adaptability, and digital intelligence make it a crucial leadership style for fostering fluidity in departmental collaboration. Through innovative vision, DL can envision new ways of collaboration, while networking intelligence enables them to connect with relevant stakeholders. Their adaptability allows them to navigate changing circumstances, and their digital intelligence ensures they leverage technology effectively in collaboration efforts (Klein, 2020). Dynamic capability theory also advocates for the importance of DL in digital transformation. One of its sub-capabilities, the redesigning of the internal structure of an organization, is founded on the premise of hiring a DL (Warner & Wäger, 2019). Based on the argument current study proposed below hypothesis.

H_4: Digital leadership (DL) has a positive effect on digital departmental collaboration (DDC).

2.6 Digital leadership, digital departmental collaboration and big data analytical capabilities

The integration of digital technologies has facilitated the emergence of expansive and intricate concepts, including big data, cloud computing, and IoT. These technologies have revolutionized data collection, enabling the exchange and real-time processing of a broad spectrum of valuable data (Tijan et al., 2021). Collaboration among different departments is often cited as a key factor for

success in business processes (Tijan et al., 2021) BDAC's necessitate departmental collaboration to establish a seamless flow of activities (Janssen et al., 2017). Enhancing fluidity in departmental collaboration can significantly improve the effectiveness of BDAC. inherently possesses greater fluidity compared to traditional collaboration methods (Warner & Wäger, 2019) due to the seamless integration of multiple information sources facilitated by digital technologies (Tijan et al., 2021). The significance of digital cross-departmental initiatives, such as Big Data Analytics (BDA), has also been emphasized (Dremel et al., 2017). BDAC's improvement can be facilitated by embedding new digital technologies into aligned business processes and integrating multiple information platforms or systems and data sources through DDC (Tijan et al., 2021). In their discussion on the digital transformation capabilities of the dynamic capability view, (Warner & Wäger, 2019) argue that the digital transformation of business processes hinges on changes in both business processes and collaboration approaches. However, they also suggest that to effect changes in business processes, broader changes are necessary in collaboration approaches.

Utilizing digital technology in accordance with organizational goals is a key success factor in the digitalization process, particularly in the implementation of big data initiatives, a responsibility typically entrusted to the DL (Tijan et al., 2021). DL's adaptive characteristic, as discussed by Klein (2020), enables them to adjust to digital technologies effectively, leveraging their digital intelligence. Additionally, their networking intelligence, also highlighted by Klein (2020), empowers them to orchestrate DDC, ensuring the achievement of desired outcomes, particularly the quality of DDDM through BDAC's. Janssen et al. (2017) assert that departmental collaboration is a pivotal component for the successful implementation of BDACs. However, Warner and Wäger (2019) argue that DDC introduces a unique fluidity into the departmental collaboration process, which in turn positively influences the efficacy of BDACs. In summary, the authors suggest that the relationship between the DL and BDACs is influenced by DDC. Warner and Wäger (2019) additionally propose that the digital transformation capability, as viewed through the dynamic capability lens, is contingent upon the deployment of a DL and the effective exploitation of new ecosystem capabilities. On the other hand, the deployment of DDC by the DL represents the exploitation of new ecosystem capabilities, aimed at enhancing the quality of decision-making through BDA. Based on these hypothesis current study proposed below hypothesis-

H_5: Digital departmental collaboration (DDC) mediates the relationship between digital leadership (DL) and big data analytical capabilities (BDAC's).

2.7 Digital leadership and top management commitment

There has been much research conducted on the impact of TMC on firm-level efforts (Dubey, Gunasekaran, & Ali, 2015; Dubey et al., 2016; Graves, Sarkis, & Gold, 2019). "TMC is the extent to which top manager demonstrate commitment to drive the firm's strategy" (Graves et al., 2019). Top managers are inclined to communicate the significance of desired outcomes, such as BDACs, by elucidating their importance, delineating the company's strategy, and establishing objectives (Colwell & Joshi, 2013). Organizations' strategic management endeavors have been hindered by insufficient support from top management (Rodgers, Hunter, & Rogers, 1993). Leadership involves establishing policies and objectives for capability development that align with the long-term vision of the organization (Dubey et al., 2015). Warner and Wäger (2019) proposed that the DL serves as a key component within the sub-capability of redesigning the internal structure, which is integral to the digital transformation capability as viewed through the dynamic capability perspective. Through the influential characteristic of the DL, as emphasized by Kane et al. (2019), it is imperative that one of the primary goals of the DL is the development of TMC.   This capability is crucial for achieving objectives such as BDA and DDDM. Klein (2020) documented that throughout the digital transformation process, the DL should assume the role of a motivational coach for the senior managers within the organization. A motivating coach role for the DL entails encouraging the top management of the firm to overcome their apprehensions about change and cultivate a culture that is conducive to digital transformation (Klein, 2020). Achieving objectives, such as implementing big data solutions, without compromising profit margins can be accomplished through the TMC. DL must ensure that organizational goals are aligned with the objective of achieving DDDM through BDAC's (Dubey et al., 2015). one of the goals of the DL should be to develop TOP (Kane et al., 2019). Based on these argument and theoretical background, current study proposes below hypothesis-

H_6: Digital leadership (DL) has a positive effect on Top management commitment (TMC).

2.8 Digital leadership, top management commitment and big data analytical capabilities

The successful full implementation of planned goals is more likely when an organization has strong TMC (Rodgers et al., 1993). "TMC is the extent to which top manager demonstrate commitment to drive the firm's strategy" (Graves et al., 2019). El-Kassar and Singh (2019) further propose that the presence of TMC and

access to large-scale data are imperative for effectively managing technological challenges. The implementation of technologies like big data is heavily impacted by the knowledge and beliefs held by top management (El-Kassar & Singh, 2019). Gunasekaran et al. (2017) Gunasekaran et al. (2017) conducted a study focusing on top management in the context of big data and found a positive correlation between TMC and the successful implementation of big data and predictive analytics. The mediation hypothesis of TMC was also examined in the context of the relationship between connectivity and big data predictive analysis. The results of the study supported this hypothesis (Gunasekaran et al., 2017). Even with the right drivers in place, achieving desired outcomes may be challenging without TMC, as TMC is crucial for overcoming technological obstacles (El-Kassar & Singh, 2019; Gunasekaran et al., 2017). The commitment of top management is vital for cultivating capabilities and aiding the company in reaching its objectives (Chadwick, Super, & Kwon, 2015; Sirmon, Hitt, & Ireland, 2007).

Within the dynamic capability view, the digital transformation capability encompasses a sub-capability known as redesigning the internal structure, which includes the component of appointing a chief digital officer (Warner & Wäger, 2019). The appointment of a chief digital officer can be considered as the deployment of a DL. The role of the DL in enhancing BDACs is thoroughly discuss above. The implementation and execution of a clearly delineated BDA strategy can significantly augment an organization's prospects for success (Grover et al., 2018). Even with foundational elements such as a DL in place, the TMC plays a crucial role in the successful implementation of a BDA strategy. This is due to the potential challenges that may arise during the execution phase, which could be difficult to overcome without the strategic guidance and oversight provided by the TMC (El-Kassar & Singh, 2019; Gunasekaran et al., 2017). The establishment of a TMC is a critical objective for a DL due to its influential nature. Top management, responsible for achieving objectives such as BDA and DDDM, can effectively leverage the TMC's strategic guidance and oversight to ensure the successful implementation of these initiatives (Kane et al., 2019). TMC is crucial for cultivating the capabilities (Chadwick et al., 2015; Sirmon et al., 2007) required to efficiently utilize data analytics and transition towards the adoption of DDDM practices across the organization. The DL is anticipated to fortify or elevate the TMC through its influential attributes. Simultaneously, the TMC is expected to exert a positive influence on the BDAC by virtue of its inherent ability to enhance capability. As stated, even with the necessary drivers in place, the desired outcomes may not be realized without top managerial commitment. This is because the TMC plays a crucial role in overcoming

technological obstacles (El-Kassar & Singh, 2019; Gunasekaran et al., 2017). Based on these arguments current study proposed below hypothesis.

H_7: Top management commitment (TMC) mediates the relation between digital leadership (DL) and big data analytical capabilities (BDAC's).

2.9 Digital leadership and digital social capital

Value that come from the networks and relationships one has in a society or community is refer as social capital (ul zia, Burita, & Yang, 2022). The sharing of information and resources within a network of relationships is often seen as a key component of social capital (Wang & Ho, 2017). Relationships between individuals in an organization and outside parties can be crucial in facilitating knowledge creation and information sharing (Zhang & Peterson, 2011). These relationships can provide access to a diverse range of perspectives, which can be valuable in generating new ideas and insights through BDAC's. Social capital is categories under three dimensions structural social capital, relational social capital and cognitive social capital (Nahapiet & Ghoshal, 1998). Who will engage in order to foster relationships and how these relationships will be achieved is explained by structural social capital (Chow & Chan, 2008). Structural social capital is an organized pattern of relationships within a society or group. It includes the way roles, rules, and procedure are established and maintained, and how they shape the interactions and behavior of individuals within the society or group (ul zia et al., 2022; Uphoff & Wijayaratna, 2000). Structural social capital allows access to multiple parties for knowledge transmission and exchange, as well as increasing the chance to trade (Ansari, Munir, & Gregg, 2012).

Relational social capital refers to the social networks and connections that people have with each other, and the trust and norms that exist within those relationships through accepted norms, mutual trust, and connectedness with others (Cabrera & Cabrera, 2005). It represent the bonds that are form through these interactions and the trust and norms that exist within those relationships (Lefebvre, Sorenson, Henchion, & Gellynck, 2016). Relational social capital can be built through a variety of activities, such as participating in community groups, volunteering, or simply interacting with people on a regular basis. Expectations and obligations are the main two aspect of this dimension (Nahapiet & Ghoshal, 1998).

While explaining the process of dynamic capability, Warner and Wäger (2019) describes that how digital transforming capability could be develop which has a sub-capability improving digital maturity. Therefore, improving digital maturity of employees is among one of the sub-capability of transforming

capability under dynamic capability view that is possible through DL. Empowering and enabling employees to carry out new initiatives is another characteristic of DL (Kane et al., 2019). DL can make them empower and enabled for the effectiveness of BDAC's through arranging some get together within or outside the organization for acquiring some new and advance information and knowledge from the industry as per structural social capital (Chow & Chan, 2008) through digital technologies, which will be utilize for BDAC's. After a series of these network meetings employees will be able to develop their own personal relationship with the other employees within or outside of organization as relational social capital (Cabrera & Cabrera, 2005). Furthermore, with the passage of time these employees will be able to communicate through their own shared meaning and interpretation as categorized under cognitive social capital (Wasko & Faraj, 2005). All this process will be supported by DL because joining and exploiting the digital eco-system for acquiring information also depends DL (Warner & Wäger, 2019). Based on the arguments current study proposed below hypothesis.

H$_8$: Digital leadership (DL) has a positive effect on digital social capital (DSC).

2.10 Digital leadership, digital social capital and big data analytical capabilities

Social capital accumulates the benefits and resources from individual and communities (ul zia et al., 2022). Similarly, when these data, information and knowledge would be collected through digital platform and the connection among parties are based on some digital platform and each party is comfortable in sharing the information through digital platform then the gained information through DSC will enhance BDAC. As Janssen et al. (2017) pointed out that the data is shared easily but sometimes information or knowledge associated with the data is not transferred so social capital is a good source for acquiring associated information and through digital technologies we have more fluid communication through DSC.

Under dynamic capability, micro-foundation of transforming capability named navigating innovation ecosystems also support the argument that firms should create DSC by joining digital ecosystem, interacting with multiple external partners and by exploiting new ecosystems capabilities (Warner & Wäger, 2019). Once these DSCs become active in day-to-day firm's life, firms would be able to gain more information about the market, which they will utilize in their data analytics for reaching to some decisions and a variety and velocity

of data will provide resilience the firm's decision making. Based on these arguments current study proposed below hypothesis.

H$_9$: Digital social capital (DSC) mediates the relationship between digital leadership (DL) and big data analytical capabilities (BDAC's).

2.11 Digital leadership and digital literacy

DL is the competence that consist of the abilities of employees to utilize digital technologies to perform their work (Cetindamar, Abedin, & Shirahada, 2021). Dynamic capability view also stresses a lot on the importance of DLIT, as Warner and Wäger (2019) claims digital maturity as one of the sub-capability of digital transforming capability.

The concept of DLIT in the context of big data is multifaceted and encompasses various skills and competencies essential for individuals to navigate the digital world effectively. DLIT is crucial for living, learning, and working in a digital society (Nabhan, 2021). It involves proficiency in ICT, information, data, media literacy, digital creation, problem-solving, innovation, communication, collaboration, participation, learning, development, identity, and wellbeing (Nabhan, 2021). Furthermore, DLIT is not just about technical skills but also about critical thinking and integration abilities in the digital economy (Chiu, Sun, & Ismailov, 2022). It is essential for individuals to have the ability to read and interpret data in the digital world and utilize digital tools effectively (Sangaji & Pribadi, 2023). In the context of big data, DLIT includes information literacy skills Gündüzalp (2021) and is fundamental for the future of education (Marisa & Djulia, 2022). The concept of DLIT has evolved to encompass various types of literacy, such as media literacy, information literacy, and DLIT (Novianti & Istiyanto, 2020). As the volume and complexity of data continue to grow, there is a need to develop big data literacy to support informed and reflective citizenship (Francois et al., 2020). This highlights the importance of understanding the potential and limitations of big data for statisticians and statistics consumers. Additionally, there is a call for greater efforts to educate people about big data and increase public literacy about big data practices (Sander & Policy, 2020). In the context of DLIT, it is crucial to enhance DLIT skills among individuals, including certified librarians, university librarians, and EFL learners, to meet academic and life goals, manage computer problems, and effectively use digital technologies (Sambo, Imran, Akanbi, & Education, 2022). However, there are challenges in implementing DLIT in teaching and learning activities, particularly in the classroom (Purmayanti, 2022). Factors affecting

digital financial literacy, such as training, motivation, age, education level, and income, also play a role in shaping individuals' DLIT (Naufalin & Tohir, 2022). In conclusion, DLIT in the context of big data is a complex and multifaceted concept that encompasses various skills and competencies essential for individuals to navigate the digital world effectively. It is crucial for individuals to develop proficiency in DLIT to meet the demands of the digital society and effectively utilize big data.

DLIT is the most important skill of DL (Kane et al., 2019) because having the understanding of digital technologies provides and edge to leader to make accurate decision (Kane et al., 2019). Building DLIT among the employees is one of the responsibility of leadership (Khaw, Teoh, Abdul Khalid, & Letchmunan, 2022). DLIT allow employee to access the stakeholder to engage them, which enable them to respond more actively and effectively (W. Li, Liu, Belitski, Ghobadian, & O'Regan, 2016). Kane et al. (2019) also claims that DL can update the employee DLIT.

H_{10}: Digital leadership (DL) has a positive effect on digital literacy (DLIT).

2.12 Digital leadership, digital literacy and big data analytical capabilities

DLIT plays a crucial role in mediating the relationship between DL and BDAC's. Wang et al. (2022) highlight that DL positively influences exploratory innovation, with digital entrepreneurial orientation and organizational culture mediating this relationship. Moreover, the study suggests that the mediating effect is positively moderated by BDAC's. Similarly, Pilav-Velic et al. (2021) found that DLIT is linked to innovative work behavior through digital practices and attitudes towards digitalized innovation, indicating a mediating role of DLIT. Furthermore, Çallı et al. (2022) emphasize that the DLIT of executive managers mediates the relationship between generative leadership and digital maturity.

Digital transforming capability of dynamic capability view has sub capability named improving digital maturity which represents DLIT through its components like identify digital workforce maturity, external recruiting of digital natives and leveraging digital knowledge inside firm (Warner & Wäger, 2019). All these characteristic signals towards employee DLIT. Kane et al. (2019) argue that DL is digitally literate and they discuss leadership role in effective way that when organization adopts new technologies for digital transformation, DL does empower employee with digital knowledge and skill for success. DLIT support leaders transformative vision and forward looking approach (Kane et al., 2019).

Recent studies have studied employee DLIT role in digital transformation that how their literacy impact digital technologies usage (Cetindamar et al., 2021) unfortunately, employee DLIT influenced by DL and its effect on BDA is scant and future research is recommended to study impact of employee DLIT on big data (Cetindamar et al., 2021). Executives DLIT need to be updated because digital technologies like BDA are changing the business environment even more rapidly every day, therefore they have to become a sophisticated data scientist so that they can make more sophisticated decisions (Kane et al., 2019). Bases on these hypotheses current study proposed below hypothesis.

H_{11}: Digital literacy (DLIT) mediates the relationship between digital leadership (DL) and big data analytical capabilities (BDAC's).

2.13 Digital leadership and industrial internet of things

The IIoT is about connecting all the industrial assets, including machines and control systems, with the information systems and the business processes (Sisinni, Saifullah, Han, Jennehag, & Gidlund, 2018). Navigating innovation ecosystems which is one of the sub-capability of digital transforming capability focused on digital ecosystem (Warner & Wäger, 2019). This ecosystem is constantly evolving and mainly depends upon mature IIOT in current study context. Current study suggests the transformation of business model, which means a transition from traditional way of value creation to digitalize way of value creation through BDAC's and it is main depends upon mature IOT (Warner & Wäger, 2019). DL is digitally literate and understand the technology and its usage, more importantly DL has the transformative vision (Kane et al., 2019). Therefore, DL will play its role in developing this digital ecosystem by participating into the IIOT platform. Warner and Wäger (2019) has identified a number of organizations who has reshaped their business model using IOT platform and they also suggested the DL for any digital transformation based on dynamic capability theory. Based on these arguments current study proposed below hypothesis.

H_{12}: Digital leadership (DL) has a positive effect on industrial internet of things (IIOT).

2.14 Digital leadership, industrial internet of things and big data analytical capabilities

Digital transforming capabilities sub capabilities including joining digital ecosystem, interacting with multiple external partners and exploiting a new

ecosystem capabilities are pointing towards interactions with partner, supplier and other stakes holder (Warner & Wäger, 2019). Recently Rajnoha and Hadač (2021) claimed that internet of things will play an effective role in development of informatics technology like BDA (Feng & Shanthikumar, 2018). Furthermore, Rajnoha and Hadač (2021) found that only significant to collect data through internet of things because data collected through such technology is dynamic and vibrant for sophisticated analysis in predicting and for big data decision making quality. Several studies have studies internet of things (Al-Fuqaha, Guizani, Mohammadi, Aledhari, & Ayyash, 2015; Da Xu, He, & Li, 2014; Díaz, Martín, & Rubio, 2016; Liu, Yang, Zhang, & Chen, 2015). Internet of things also facilitate concept like real time operation, efficiently data utilization with BDA (Lv, Song, Basanta-Val, Steed, & Jo, 2017; Roden, Nucciarelli, Li, & Graham, 2017). DL being digital literate leader and know how these technologies works will invest in such technologies like IOT (Kane et al., 2019) and these technologies will help leader in their digital transformation. Based on these arguments current study proposed below hypothesis.

H_{13}: Industrial internet of things (IIOT) mediates the positive relationship between digital leadership (DL) and big data analytical capabilities (BDAC's).

2.15 Big data analytical capability and data driven decision making

Digital transformation encompasses the replacement of traditional business standards and perspectives with more contemporary, technology-driven approaches (Ghosh et al., 2021). This entails the replacement of business models, through which organizations create value and generate profits by managing structured, networked activities (Warner & Wäger, 2019; Zott, Amit, & Massa, 2011). The transition from antiquated, traditional business models, characterized by value creation and profit generation through experiential (McAfee et al., 2012) and intuitive (Dane & Pratt, 2007) decision-making, to DDDM is a fundamental aspect of digital transformation. Decisions driven by BDA are rooted in insights derived from data, rather than relying on experience or intuition. This shift towards DDDM is expected to enhance organizational decision-making processes. DDDM is reliant on the capabilities of BDA (Janssen et al., 2017) but Digital transformation capability pertains to the organization's capacity to cultivate and implement novel digital competencies (Ghosh et al., 2021). Structured networked activities facilitate the interplay among organizational resources, including machinery, human capital, and control systems. This

interaction is enabled by the application of analytical capabilities to data, a capability made feasible by the advancement of digital technologies. This, in turn, allows for proactive decision-making in business operations. (Ghosh et al., 2021). Rigorous decision-making techniques have been developed through the capabilities of BDA, which is currently more influential than other analytics methods previously employed (McAfee et al., 2012). Awan et al. (2021) posited that BDA capabilities play a pivotal role in the decision-making process. BDAC's is instrumental in creating value for organizations (Wixom, Yen, & Relich, 2013); Moreover, it harnesses management and talent capabilities, thereby generating additional business value that contributes to enhanced decision-making processes (Awan et al., 2021). In the context of big data, BDAC's have been accorded significant importance compared to big data decision-making, which is a broader concept encompassing various aspects beyond analytics. Shamim, Zeng, Shariq, and Khan (2019) asserted that the literature has yet to provide a definitive answer on how to enhance big data decision-making capabilities. Based on the arguments current study proposed below hypothesis.

H_{14}: Big data analytical capabilities (BDAC's) has a significant positive impact on data driven decision making (DDDM).

3. RESEARCH FRAMEWORK

After a detail discussion, that what the problem of research is research question and research objectives drive study towards a discussion about the interaction of several constructs with each other. Based on the discussion about the interaction of the constructs among each other, author proposed some hypothesis and depiction of the interaction among all the constructs and the hypothesis developed on the basis of detail discussion lead us towards below framework as depicted in Fig.2 below.
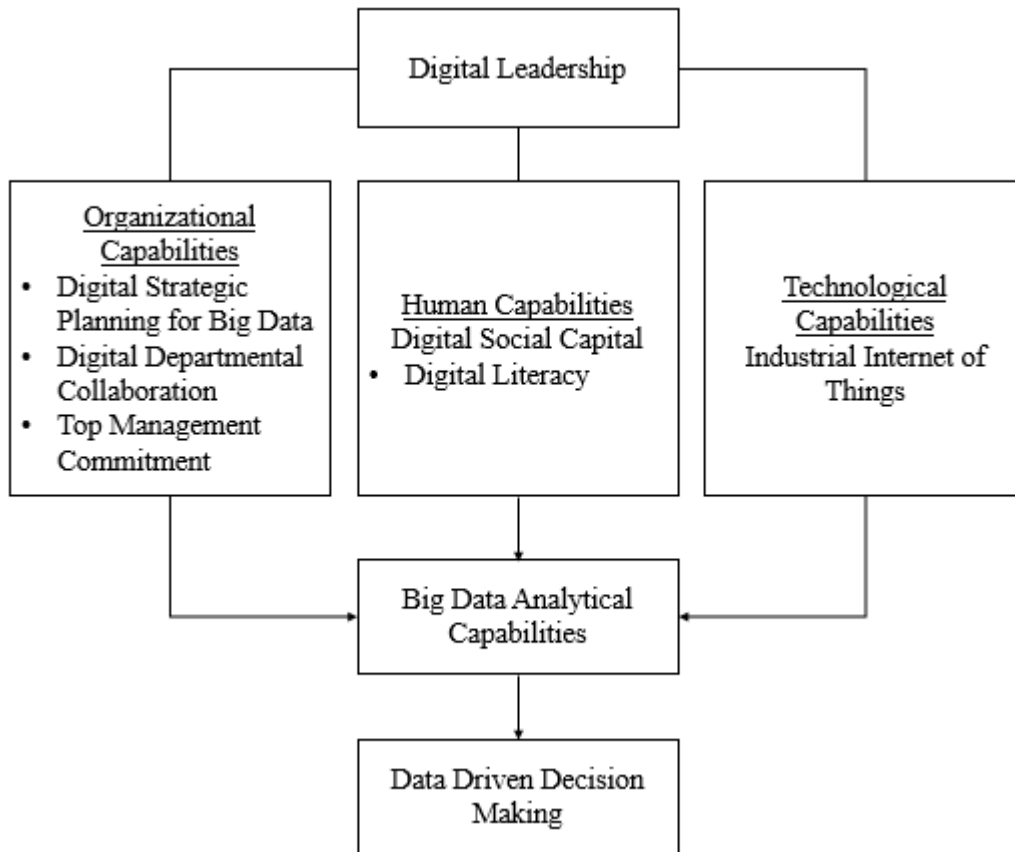
Fig. 2: Research framework (Source: Author's own)

4. PROPOSED METHODOLOGY

Current study adopt positivist, pragmatic research approach as this study is focus towards industry and profit making organizations. Deductive research approach is used which focused towards hypothesis development and quantitative analysis mainly. Survey strategy is applied using a structured questioner to collect data and the time horizon is cross sectional.

4.1 Sample Size Features Sample Size

Data were from 277 senior personnel working in chemical sector in Pakistan including paint manufacturing firms and pharma companies. Sample size is calculated through online calculator (Soper, 2021) for structural equation models and also supported by Westland (2010). This sample size calculator calculates sample size after considering the number of variables, item and the probability level.

4.2 Sampling Techniques Used

Current study focuses on snowball sampling technique because our study is discussing highly confidential maters like strategic planning, leadership style and

decision making so it is hard to get response on these issue, this is the reason we used snowball sampling technique.

4.3 Measures

A seven-point Likert scale is used to measure the constructs through adapted scales. DL scale was initially consisted of six items adapted by Zeike, Bradbury, Lindert, and Pfaff (2019) but due to reliability issue three items were deleted and is then measured with three items. DDC scale was initially consisted on four items adapted from Wamba et al. (2017) but due to reliability parameters one item was deleted and finally measured with three items. The construct of BDAC's is assessed using a 15-item scale, which is subdivided into three sub-dimensions: infrastructure flexibility, management capabilities, and personal capabilities having three items each. This scale was adapted from a previous study by (Akter et al., 2016). Nine item are related to self-develop big data quality that is considered as an integral element of BDA in current study. Current study used four categories as indicators discussed above in DBAC's scale details that are infrastructure, management, personal capability and big data quality by taking the average of their relevant items.

TMC was initially consist of five items but due to reliability issue one item was dropped and the construct is measured with four items scale. DSP was initially consist of eleven items but due to reliability issue DSP is measured through a eight items and big data decision making is measured through seven item scale, two item were dropped due to reliability issue and these scales were adapted from El-Kassar and Singh (2019), Powell (1992) and Shamim et al. (2019) respectively. DLIT scale consist of five categories including information and DLIT, communication and collaboration, digital content creation, safety and problem solving. Each category consist of three item which mean fifteen items in total and these five categories are used as an indicator in software for measuring DLIT by taking the average of these three items, scale adapted from Cetindamar et al. (2021). DSC is measured using 10 item scale used by ul zia et al. (2022), scale includes items related to structural, relational and cognitive social capital having three, four and three items respectively. IIOT is measured using a four item scales adapted from (Dijkman, Sprenkels, Peeters, & Janssen, 2015).

5. RESULTS OF RESEARCH

5.1 Reliability and validity

Authors makes sure that all the reliability and validity criteria are met according to the standards and after confirming reliability and validity of the data further analysis that includes hypothesis testing was initiated.

5.2 Hypothesis Testing

DL do not effect BDAC's directly. DL need to work on process or means through which DL can achieve their desired outcomes. DL should formulate a DSP through its digitalized vision. DL should utilize his/her collaborative approach to strengthened DDC for enhancing BDAC's. DL should focused towards employee's relationship with other industrial managers. DL should use his/her digital skills to promote employee social capital through digital platform which may play an effecting role in getting access to updated information and knowledge sharing which is essential for BDAC's. Other than this DL should also work for the DLIT of employee. The more the employees are digitally literate the more effective BDAC's organization would have which will ultimately influence DDDM positively. All results are reflected in Table. 8 and 9.

Table.8 Hypothesis Testing

Hypothesis	Relationship	β	SD	T Value	LL (2.5%)	UL (97.5%)	Result
H1	DL -> BDAC	0.021	0.01	1.46	-0.007	0.049	Rejected
H2	DL -> DSP	0.664	0.03	23.41	0.606	0.718	Accepted
H4	DL -> DDC	0.691	0.02	31.49	0.643	0.73	Accepted
H6	DL -> TMC	0.751	0.02	36.47	0.706	0.788	Accepted
H8	DL -> DSC	0.563	0.04	14.62	0.482	0.633	Accepted
H10	DL -> DLIT	0.701	0.03	24.46	0.637	0.751	Accepted
H14	BDAC -> DDDM	0.882	0.01	63.72	0.851	0.905	Accepted
H12	DL -> IIOT	0.043	0.09	0.50	-0.167	0.145	Rejected

(Source: Author's own)

Table.9 Mediation testing

H	Relationship	β	SD	T Value	LL (2.5%)	UL (97.5%)	Result
H3	DL -> DSP -> BDAC	0.056	0.011	4.99	0.033	0.077	Accepted
H5	DL -> DDC -> BDAC	0.022	0.008	2.83	0.005	0.036	Accepted

H9	DL -> DSC -> BDAC	0.376	0.027	14.20	0.323	0.428	Accepted
H7	DL -> TMC -> BDAC	-0.072	0.012	6.17	-0.096	-0.05	Rejected
H11	DL -> DLIT -> BDAC	0.222	0.017	13.11	0.189	0.255	Accepted
H13	DL -> IIOT -> BDAC	0	0.001	0.08	-0.002	0.001	Rejected

(Source: Author's own)

6. DISCUSION

Study was initiated with a research problem that senior industry managers are confused that how to initiate strategic digital transformation initiatives in their firm (Ghosh et al., 2021). Followed by the aim that is to provide a framework for organizational, human, and technological capabilities enhancement to boost BDAC's for DDDM. These research problem and aim generates a relevant research question that how DL will enhance organizational capabilities, human capabilities and technological capabilities to influence DDDM through BDAC.

Organizational capabilities that includes DSP, DDC and TMC are positively link with DL. DL has a positive influence on DSP, DDC and TMC, DL will play its role during digital transformation for enhancing DSP, DDC and TMC. DL has the strongest effect on TMC followed by the DDC and DSP with a β value of 0.751, 0.691 and 0.669 respectively. This is how DL will enhance organizational factors including DSP, DDC and TMC.

Human capabilities including DSC and DLIT is also influenced by DL. DL will play its role during digital transformation for enhancing DSC and DLIT. DL is positively associated with DSC and DLIT. DL have the strong effect on DLIT which is 0.701 followed by DSC which is 0.563. This is how DL enhance human factors including DSC and DLIT for digital transformation.

Technological factor including IIOT which was also proposed that DL will influence IIOT unfortunately hypothesis were rejected because DL has no significant impact on IIOT. The effect size of DL on IIOT is 0.043.

Result regarding organizational and human capabilities were according to expectation but the results regarding technological enhancement is not according to expectation but we are unable to compare these results with previous results as the current study is discussing these relationship for the first time.

Organizational capability including DSP and DDC mediates the relationship between DL and BDAC. The confidence interval is also up to the acceptable

level. Whereas TMC which was also supposed to mediate the relationship between DL and BDAC fails to mediate the relationship. TMC as mediation has the negative impact on the relationship between DL and BDAC. Furthermore, the confidence interval value is also not according to the required range.

Human capabilities including DSC and DLIT mediates the relationship between DL and BDAC having a significant result. The confidence interval is also up to the acceptable level.

Last, the impact of BDAC on DDDM was also proposed and it is found after data analysis that BDAC has a positive effect on DDDM. The effect size of BDAC on DDDM is 0.882, which is the highest effect size in the whole model. T value and the values for the confidence interval are all with in the desired range.

7. CONTRIBUTION

The main purpose of scientific research in management sciences is the upgradation of theoretical and practical knowledge in the relevant field. Current study has some theoretical and practical contribution, which is discuss below in the relevant sections.

7.1   Theoretical contribution

This study makes noteworthy contributions to the existing literature in several ways. Firstly, it adds to the discourse on DL, a field that is still in its emerging stages. We have established that DL enhance organizational capabilities, such as DSP for big data value creation, fostering DDC, and enhancing TMC. DL also enhance human capabilities, such as DSC and DLIT. Secondly, we have also determined that the relationship between DL and BDA capability relies on the enhancement of organizational and human capabilities. We posit that effective leadership positively influences operational capabilities when supported by strategic-level competencies, including strategic planning and DDC. In the context of DDDM and DCs, we argue that to develop relevant DCs at the operational level, organizations need to enhance DCs at the strategic level. Thirdly, we contend that DL is also crucial for DDDM, as DL enhance BDACs through the enhancement of organizational and human capabilities. DDDM relies on BDACs, achievable through DL and the enhancement of organizational and human capabilities. Additionally, Lee et al. (2023) suggest that information system scholars should shift their focus to organizational capabilities rather than IT expenditures.

This study makes a substantial contribution to the conceptualization of BDACs. Prior investigations, exemplified by Wamba et al. (2017), have approached the study of BDA through a tripartite framework, encompassing personal, infrastructure, and managerial dimensions. In contrast, the present study enriches the BDAC construct by introducing big data quality as an integral dimension. The authors advocate that aspects of big data quality, including meticulous data cleaning and the elimination of extraneous data to ensure accuracy and completeness, should be orchestrated by the analytical team tasked with data analysis. This proposition is predicated on the notion that the analytical team possesses a nuanced understanding of the objectives and scope of the data analytics endeavor, thereby enabling judicious data handling. Moreover, the implementation of data quality practices within the analytical department facilitates the pursuit of additional information or insights pertinent to the data, a practice underscored as pivotal by Janssen et al. (2017).

7.2 Practical contribution

DSP is a crucial aspect for a DL to effectively navigate the complexities of the digital landscape. By engaging in DSP, DL can align their organization's goals with digital initiatives, ensuring a cohesive and forward-thinking approach towards boosting BDAC's. This process involves analyzing current digital capabilities, identifying areas for improvement, setting clear objectives, and developing a roadmap for implementation.

Furthermore, DDC plays a key role in the success of digital initiatives. By fostering collaboration among different departments within an organization through digital platform, DL can leverage diverse expertise and perspectives to drive BDAC. Collaboration between departments such as IT, marketing, sales, and operations can lead to more holistic digital strategies and solutions that address the needs of the entire organization.

In a study by McKinsey & Company (2018), it was found that organizations that excel in digital strategy and collaboration across departments are more likely to outperform their competitors in terms of revenue growth and profitability. This highlights the importance of DSP and DDC in achieving digital success.

DL plays a crucial role in leveraging BDAC's within organizations. To enhance these capabilities, it is essential for DL to rely on DSC and DLIT. DSC refers to the relationships, networks, and connections that individuals or organizations have in the digital realm. It encompasses the ability to leverage these connections for knowledge sharing, collaboration, and problem-solving.

By tapping into DSC, DL can access a wealth of information and expertise from their networks, enabling them to make decisions that are more informed when it comes to BDA.

Furthermore, DLIT is another critical component for enhancing BDAC's. DLIT refers to the ability to effectively navigate, evaluate, and utilize digital technologies and tools. In the context of BDA, DL enables DL to understand the complexities of data collection, processing, analysis, and interpretation.

In conclusion, DL that relies on DSC and DLIT is well-positioned to enhance BDAC's within organizations. By leveraging DSC for knowledge sharing and collaboration, and by developing strong DLIT skills for effective data utilization, DL can drive improve decision-making and achieve competitive advantage in today's data-driven business environment.

8. CONCLUSION

Study has been conducted for survival of those firms that are not in category of future ready organization. Study has proposed a model through which, organizations would be converted into smart factories for their survival. Data has been collected from 227 top managers of firms in Pakistan. Structure equation modelling is applied with bootstrapping for mediation test, results shows that organizational capabilities and human capabilities is crucial for achieving BDAC and DDDM.

All the organizational factors including DDC, DSP and TMC is positively influenced by DL, which confirms the capability of DL to set a proper DSP, it digital skills for transforming department collaboration into digital collaboration. Furthermore, DL also enhances the TMC that is crucial for implementing technologies such as BDA and DDDM. DDC and DSP also mediates the relationship between DL and BDAC positively. Whereas, TMC did not mediates the relationship between DL and BDAC.

Human factor including DSC and DLIT are positively influence by DL that further mediate the relationship between DL and BDAC positively.

Technological factor comprises of IIOT is neither influence by DL nor it mediate the relationship between DL and BDAC.

Current study shows an holistic view of the capabilities organization posses through which organizations can achieve their desired outcome that is BDAC's for DDDM in current study context. Study also provides an empirical evidence

that how the sub capabilities of digital transforming capability of dynamic capability view plays their role in enhancing the BDAC's for DDDM.

Without addressing these organization and human factors BDAC and DDDM will not be achieve and implementation of big data solutions in its true sense will remains a dream.

9. LIMITATION

One major limitation of snowball sampling is the potential for sampling bias (Faugier & Sargeant, 1997). This bias can arise due to the non-random nature of the method, as participants are recruited based on existing connections and referrals, leading to a sample that may not be representative of the entire population (Magnani et al., 2005). Snowball sampling is particularly prone to selection bias, where participants who share similar characteristics or views are more likely to be included in the study (Lalla et al., 2020).

Moreover, snowball sampling may restrict the diversity of the sample and limit the range of perspectives represented in the research (Nuseeb et al., 2021). As the sampling method relies on referrals from initial participants, there is a risk of homogeneity in the sample, with new participants being more likely to resemble the individuals who referred them (Flanagan & Lewis, 2019). This can lead to a lack of variability in the data collected and may compromise the generalizability of the findings (Møller et al., 2021).

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LIST OF PUBLICATIONS BY THE AUTHOR

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Journal publication

1. Shariq, S. M., Mukhtar, U., & Anwar, S. (2018). Mediating and moderating impact of goal orientation and emotional intelligence on the relationship of knowledge-oriented leadership and knowledge sharing. Journal of Knowledge Management. https://doi.org/10.1108/JKM-01-2018-0033. (WOS Q1).

2. Shamim, S., Yang, Y., Zia, N. U., Khan, Z., & Shariq, S. M. (2023). Mechanisms of cognitive trust development in artificial intelligence among front line employees: An empirical examination from a developing economy. Journal of Business Research, 167, 114168. https://doi.org/10.1016/j.jbusres.2023.114168. (WOS Q1).

3. Shamim, S., Zeng, J., Shariq, S. M., & Khan, Z. (2018). Role of big data management in enhancing big data decision-making capability and quality among Chinese firms: A dynamic capabilities view. Information & Management https://doi.org/10.1016/j.im.2018.12.003. (WOS Q1).

4. Awan, U., Shamim, S., Khan, Z., Zia, N. U., Shariq, S. M., & Khan, M. N. (2021). Big data analytics capability and decision-making: The role of data-driven insight on circular economy performance. Technological Forecasting and Social Change, 168, 120766. https://doi.org/10.1016/j.techfore.2021.120766. (WOS Q1).

5. Shamim, S., Zeng, J., Choksy, U. S., & Shariq, S. M. (2020). Connecting big data management capabilities with employee ambidexterity in Chinese multinational enterprises through the mediation of big data value creation at the employee level. International Business Review, 29(6), 101604. https://doi.org/10.1016/j.ibusrev.2019.101604 (WOS Q1).

6. Shariq, S. M., Chromjakova, F., & Ortega, M. J. R. (2023). The importance of accountability for knowledge sharing: The role of knowledge-oriented leadership. International Journal of Organizational Leadership, 12(4), 369-388. https://doi.org/10.33844/ijol.2023.60383.

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◦ *Inventory maters at plant*

◦ *Problem solving*

◦ *Controlling loss during production*

◦ *Owning and executing production plan*

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Role of digital leadership, digital technologies and dynamic capabilities to influence big data analytical capabilities for data driven decision-making

Role digitálního vedení, digitálních technologií a dynamických schopností při ovlivňování analytických schopností velkých dat pro rozhodování založené na datech

Doctoral Thesis Summary