

DIGITAL LEADERSHIP AND OPEN INNOVATION: ROLE OF DIGITAL MINDSET AND DIGITAL SELF-EFFICACY

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Abstract

This study examines the effect of digital leadership on open innovation in organizations. Specially propose that digital leadership can promote open innovation, but this relationship is mediated by employee digital mindsets and moderated by digital self-efficacy. Social Learning Theory (SLT) is used to investigate the relationship between digital leadership and open innovation and mediating role of Employee digital mindsets as well as moderating effects of Digital Self-Efficacy on Open Innovation. Target population of the study was software companies based in Rawalpindi, Islamabad. Time lagged study and Convenient Sampling was used to collect data, sample size of this research was 350, SPSS 21 and AMOS was used for data analysis. In order to estimate the direct, Mediation, and moderation effects that support the suggested theoretical model simultaneously, the statistical analysis depend on the process macro. Moreover, Results reveals that there is significant relationship between Digital Leadership and Open Innovation, Positive Role of Digital Mindset on Open Innovation however we found moderating role of digital self-efficacy as the results are not significant. Our research contributes that digital leadership will support open innovation, and have implication for Practitioners and researchers leveraging digital technology to promote innovation in organizations. Future direction and Practical Implications are also discussed.

1.1 Overview of the Research:

In the Business world, Digital leadership is a novel idea where management tasks are completed using digital platforms (Mihardjo, et al 2019) The digital era includes a method that uses technical advancements to solve organizational sustainability and effectiveness concerns. It is imperative that leaders fully understand the digital world and pay closer attention to the digitalization phase of the

twenty-first century when employees realize how important the digital world is (Dorner and Edelman, 2015). This is why companies choose competent leaders over managers in today globalized environment. A problem that might be overlooked amidst other developments is meeting business needs, such those related to labor in addition to researching new technologies.it has been required of leaders to inspire this varied workforce of people.

Organizations may manage risks of ongoing uncertainty with the aid of digital leadership. (Fenwick et al., 2021) The modernization of organizations now heavily relies on digital leadership. (Peng, 2021) Digital disruption presents new difficulties for leaders (Kane et al., 2019) Today's digital trends depend heavily on leadership to drive swift decisions-making and encourage change, understanding digital leadership is beneficial (Jäckli & Meier, 2020). Digital revolution is centered on highly qualified human resources (Hanna, 2018). As Cortellazzo et al. (2019)

Leaders are essential to creating a digital culture that facilitates collaborative activities in complicated scenarios with ethical problems, as noted in the review concerning leadership and the digitalized world. Digital enterprises now make up the bulk of companies that compete globally. (Albollado & Sehab, 2018). The advancement of contemporary digital technologies and the appearance of fibers in the digital sphere have led to a transformation of traditional procedures and business structures. (Barchiesi & Fronzetti Colladon, 2019, Berne-Martinez et al. 2021. Cabras et al. 2017: Palmie et al. 2020., Holzmann et al., 2020, Weaseling et al. 2020) Being a digital business and having a leader with digital expertise can enable quick reactions to the shifting multicultural networks in the globe and restructure the company while being adaptable at all times. De Waalet et al. (2016), define digital leadership as a leadership approach that blends transformational leadership with the use of digital technology; The use of digital assets to accomplish organizational goals at organizational and individual level is the functions of digital leadership in organizations (Dimitrios et al., 2013 Thomson et al., 2016) Recent developments in digital technology have drastically change the competitive landscape, employment roles, and organizational structure in many firms. Digital leaders require a certain skill set to solve these problems and help business adapt (Frank et al., 2019 Somerville. 2013 According to psychologists, mindset refers to a way of thinking and orientation in the world that determines our perceptions,

emotions, and behaviors. Digital Mindset refers to the capacity to see how data, algorithm, and artificial intelligence may pave the way for success and create new chances in corporate environment where data intensive and intelligent technology is becoming more and more prevalent. Though it requires effort, adopting a digital attitude is worthwhile and business who possess it react to market changes more swiftly and are well positioned to seize new business possibilities. Digital transformation is frequently met with resistance, just like any change project, and early mistakes are unavoidable. Tsedal Neeley and others (2022) a new understanding is necessary in light of the evolving workplace. A mindset is an experience-based collection of knowledge structures that are shared by a group of individuals who act in accordance with their shared style of thinking when taking in and processing information. (Vivienne Benke, 2013).

In order to fulfil rising expectations and exploit new opportunities, people will need to become increasingly digitally proficient and adaptive (Larson & DeChurch, 2020). It has been demonstrated that self-efficacy connected to using digital systems in particular predicts effective utilization of those systems (Ulfert et al., 2022) Competence and beliefs should be distinguished even though they are connected since they each have their own effects on learning, motivation, and performance (Hughes et al., 2011 Marsh et al., 2017 Pajares & Schunks, 2002)

Digital self-efficacy people's willingness to use digital technologies and is not just tied to learning new skills (Hsu & Chiu, 2004; Joo et al., 2018; Kher et al., 2013) a wide notion, open innovation is researched at various levels, including those individuals, groups/projects, business units, and organizations (CC.J Cheng & Huizingh, 2014; Chesbrough et al., 2006; West et al., 2014) one of the most crucial strategies for business to compete in a volatile market is open innovation (OI) (Bogers et al., 2018) the management of innovation processes in corporations, control over knowledge, and innovation-oriented processes that draw on outside ideas to enable good and effective

invention are all included in the concept of open innovation (Barham et al.,2020) (Ciesielska,2018).

One of the most crucial strategies for business to compete in a volatile market is open innovation (OI) (Bogers et al.,2018) The term “Open innovation” refers to the control of knowledge ,the management of innovation processes in businesses (Barham et al.,2020) and practices that encourage effective and beneficial innovation by utilizing outside ideas (Ciesielska.,2018) Therefore ,open innovation advises businesses to seek out collaboration and partnership with various organizations, professionals and experts in order to innovate strategically outside their own limitations (Cavallo et al.,2021) Open innovations have drawn a lot of scholarly attention recently (Gupta et al.,2023) and are an extremely important component of organizations digital transformation (Wiesbock and Hess,2020).To maintain ongoing innovation in processes, goods and services and to gain a competitive edge, the enterprises must rely on outside information and research collaborations (Dahlander and Gann,2010 : Popa et al.2017;Gupta et al.2023) (Singh et al.2021) In recent years, the influence of digital transformation on markets and organizations have been increasingly apparent and recognized (Cortellazoo et al.2019) According to research, organizations survive in today’s cutthroat environment because of innovation (Ahmed et al.,2020) Therefore, in the context of digital technology, business organizations innovate their process, business model and services. (Nambisan et al., 2017).Bandura (1977) Believes that people actively digest information and consider the implications of their actions Learning from observation is possible if there is no cognitive activity at work. There psychological elements operate as a mediator throughout the learning process, deciding whether or not a new response is learned. The study examines how leaders in the digital age foster their team’s ability to think creatively in order to adapt to emerging trends and technologies that foster open innovation. This research shed light on the factors that contribute

to successful open innovation in organizations, and can inform the development of strategies and practices that can help organizations to foster a culture of innovation and drive business success in the digital age .Therefore, open innovation advises businesses to seek out collaboration and partnership with various organizations professionals, and experts in order to innovate strategically outside their own limitations (Cavallo et al., 2021)

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Digital Leadership

Digital leaders are distinguished by their ability to motivate and influence others, guiding their organizations towards strategic success through digitization (Schiuma et al., 2021). Bennis (2013) adds that resilience and adaptability are essential traits for digital leaders. McCarthy et al. (2021) identify eight specific characteristics of leaders in digital transformation:

2.2. Digital Mindset

A digital mindset is defined as the thought patterns, attitudes, or orientations regarding the adoption of digital technologies, which are crucial for effective leadership in the digital age (Allen, 2020). Leaders with a digital mindset are observant of market trends, customer needs, and technological advancements. They foster an environment that encourages continuous learning and technological proficiency among team members.

Research indicates that a digital mindset is vital for the human side of digital transformation, promoting innovative thinking and experimentation with emerging technologies like cloud computing, blockchain, and artificial intelligence (Kane et al., 2017; van der Meulen et al., 2020). This mindset involves comfort with ambiguity and a preference for iterative processes over traditional high-fidelity planning (El Sawy et al., 2016; Hofert et al., 2018).

2.3. Digital Self-Efficacy

Digital self-efficacy refers to an individual's confidence in their ability to effectively use digital technologies (Bandura, 1982; 2003). This

confidence is influenced by education, training, experience, and overall digital literacy. High digital self-efficacy leads to proactive learning, better performance, and resilience in the face of challenges (Bellini et al., 2000; Rohatgi et al., 2016). It is crucial for continuous adoption of emerging technologies and overcoming the psychological barriers associated with digital innovation (Martin, 2008; Ng, 2012).

2.4. Open Innovation

Open innovation (OI) involves leveraging knowledge flows across organizational boundaries to enhance value creation and capture competitive advantage (Chesbrough & Bogers, 2014). OI research spans various levels, from individual to national systems, yet often focuses on firm-centered approaches (Markovic & Bagherzadeh, 2018; Radziwon & Bogers, 2019). It emphasizes the importance of external stakeholder engagement in extending innovation practices beyond isolated firms (Randhawa et al., 2021).

The competitive aspects of OI require balancing the interests of multiple stakeholders, fostering ecosystem development (Jacobides et al., 2018; McGahan et al., 2020). This approach underscores the need for a comprehensive understanding of inter-organizational value generation and capture processes (Bogers et al., 2017; Chesbrough et al., 2018).

Integrating digital leadership, mindset, self-efficacy, and open innovation forms a cohesive framework for navigating digital transformation. Digital leaders must embody a digital mindset, fostering an environment of continuous learning and technological proficiency. High digital self-efficacy is essential for leveraging digital tools effectively, while open innovation practices ensure sustainable competitive advantage through collaborative value creation. Together, these elements drive successful digital transformation in today's VUCA environment.

2.5 Digital Leadership and Open Innovation

Digital leadership and open innovation are two concepts that are increasingly being used to help organizations stay competitive in a rapidly

changing digital world. Digital leadership is the ability of managers and executives to leverage technology to improve organizational performance. This includes the use of analytics, data-driven decision making, and cloud-based applications. Open innovation, on the other hand, is the practice of utilizing external resources, such as outside experts, customers, and suppliers, to develop new ideas and solutions to address organizational challenges. Both of these concepts are important for organizations to remain competitive and to stay ahead of the competition. Digital leadership involves being able to recognize opportunities and challenges posed by technology, and then taking advantage of them to improve organizational performance. It also involves leveraging technology to gain a competitive edge, such as through data-driven decision making, analytics, and cloud-based applications. Open innovation also contributes significantly to building competitive advantage. By utilizing the expertise of outside experts, customers, and suppliers, organizations can develop new ideas and solutions to solve the challenges they are facing. This might assist business in staying one step ahead of rivals and competitive in a digital environment that is changing quickly, digital leadership and open innovation are both critical.

1. **H1** Digital leadership is positively and significantly associated with Open Innovation.

2.6 Digital leadership and Digital Mindset:

Environments in which people live, work and play are profoundly altered by digital revolution. To effectively execute digital transformation and realize digital innovation, people and their actions are identified as key factors. (Ben Shneiderman et al 2007.) within this framework, the need of employees have a "digital mindset" is often emphasized. (Satish Nambisan, et al. 2017) The term "digital mindset" has been applied inconclusively in the literature on information systems, originating from various viewpoints or viewed as a component of digital skills, and suffering from a general lack of clarity in its meaning. It is sometimes used interchangeably with digital

thinking (Gerald C. Kane et al. 2017) Digital leadership is the ability to use digital technologies and processes to drive innovation, collaboration, and productivity in the workplace. It involves leveraging digital tools and resources to enable better decision making, collaboration, and communication. Digital leadership involves a deep understanding of the digital landscape and its potential to create value for an organization. A digital mindset is the commitment to using digital technologies to solve problems, drive innovation, and create a competitive advantage. It is the ability to think strategically about how digital tools and trends can be used to create new opportunities. Digital mindset is a crucial skill for both individuals and organizations, as it enables them to take advantage of the opportunities presented by digital transformation. It involves the ability to think critically and use digital tools to identify and capitalize on opportunities. It also requires an understanding of the digital landscape and the potential of digital technologies to create value.

2 **H2.** Digital Leadership is positively and significantly associated with Digital Mindsets.

2.7 Digital Leadership and Digital Self Efficacy:

Digital leadership is exerting influence through the use of technology, motivate, and enable colleagues to work collaboratively to achieve common goals. It involves the use of digital tools and strategies to motivate, engage, and empower employees in their day-to-day roles. Through digital leadership, organizations can create a culture of innovative thinking, collaboration, and problem-solving. The digital self-efficacy constructs psychological underpinnings encompass perspectives on digital technology. (Santoro et al., 2020) Majority of the individuals believe that one of the most essential skills one might possess in 21st Century data economy is digital competence. (Bouncken and Kraus, 2021). Technical obstacles accompanying the deployment of new technologies necessitate that people be prepared to interact with them and find solutions when they occur. (Ritala et al., 2021). Therefore, using digital

technology to gather and organize information in order to solve problems and jointly create a body of knowledge is a component of digital competence. (Ferrari et al., 2012; Trilling and Fidel, 2009; Vireo, 2015). To fulfill one's responsibilities, it is no longer sufficient to be extremely skilled at using a narrowly limited and static repertory of digital tools and technology, employees must have a mindset that has faith in their ability to learn new skills and knowledge necessary to operate new and perhaps more sophisticated technologies as they arise in the future, given the constant introduction of new technologies. (Martin, 2008; Ng, 2012). The confidence that one can use digital tools and technologies to accomplish a goal is known as digital self-efficacy. It is the confidence to use digital technologies to find and apply information, solve problems, and communicate effectively. Digital self-efficacy is an important factor in digital literacy, as it enables individuals to use digital tools to advance their own learning and development. Digital self-efficacy also has implications for digital leadership, as it helps individuals to be more confident and effective in their roles as digital leaders.

3 **H3.** Digital Leadership is positively and significantly associated with Digital Self Efficacy.

2.8 Employee Digital Mindset and Open Innovation

In order to drive innovation, an organizations business model must be open to the outside world. This includes using outside resources (outside-in innovation processes) and bringing new ideas to the market (inside-out innovation processes). (Kraus et al., 2021) Digital change blurs boundaries and makes it possible to include suppliers and customers into the process of creating new ideas. (Gasman et al. 2010), When customers may be a great source of ideas for new products (Oganisjana and Kozlovskis 2019) Digital mindset is the way companies think about and approach digital disruption. It involves having a clear understanding of the digital landscape and how it can be leveraged to create value for customers. The combination of these two concepts drives innovation and competitive advantage.

Companies that have a digital mindset and pursue open innovation strategies are able to swiftly identify and capture opportunities in a rapidly changing digital world.

H4 Digital Mindset is positively and significantly associated with Open Innovation.

2.9 Digital Self Efficacy and Open Innovation

Digitalization will become more and more integrated into processes, infrastructures, services, and goods. (Proeger and Runst, 2020). This does not imply that future leaders will always require technical and informatics expertise on every facet and reasoning of technology advancements. However, they will undoubtedly need to know how to leverage digital technology to promote new Products and services, change their business model, gain market share, boost and diversify performance, and create and protect disruptive opportunities. (Suresh Malodia et al., 2023) Trust and transparency with a range of stakeholders are factors that influence open innovation. (Chesbrough, 2020; Leonidou et al., 2020; Zhu et al., 2019). Companies have the opportunity to form productive partnerships with external stakeholders, who may have specialized in particular industries, in order to assist them in identifying trends, breaking into new market, creating new goods, diversifying their business model, and creating new sources of income for their company. (Camille & Brescia, 2022; Centobelli, Coercion, Charon, et al., 2020; Su et al., 2022).

H5. Digital Self Efficacy have positive effect on Open Innovation.

2.10 Mediating Role of Digital Mindset between Digital Leadership and Open Innovation

Open Innovation Involves the collaboration and co-creation of ideas, solutions, and

Knowledge with external partners. The concept of a digital mindset encompasses the attitude, beliefs, and abilities needed to effectively leverage digital technologies and adapt to digital change. It involves embracing innovation, being open to learning new skills, and having a growth-oriented mindset. When leaders exhibit digital leadership behaviors and create a culture that supports digital transformation, it can foster a digital mindset among employees (Jiang and Jia 2019). Digital leaders who promotes a digital mindset create an environment that supports collaboration, risk-taking, and knowledge sharing, which in turn facilitates open Innovation. (Riaz et al.2020)

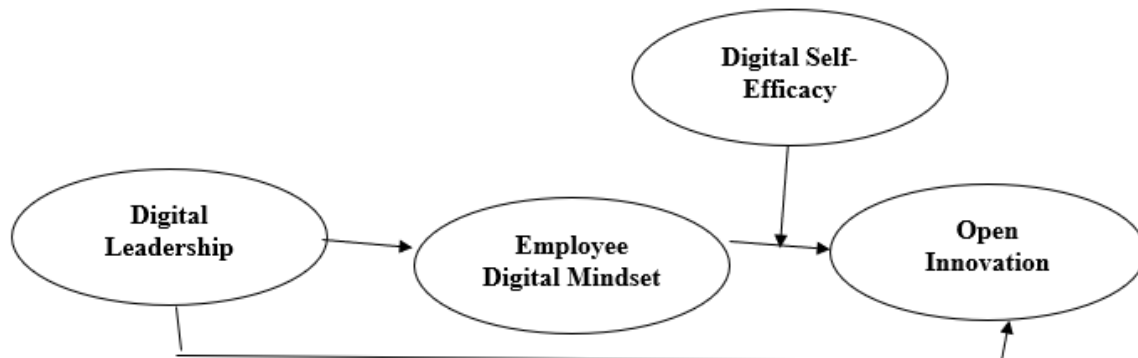
H 6. Digital Mindset mediates the relationship between digital leadership and open Innovation.

2.11 Moderating Role of Digital Self-Efficacy.

Open innovation results and digital leadership were impacted by digital self-efficacy. High digital self-efficacy individuals are more likely to adopt and use digital technology productively in their profession. (Li and Liu et.al 2015). This can have a positive impact on their ability to engage in open innovation activities and contribute innovative ideas, Open innovation and digital leadership can work better together when digital self-efficacy is high. Digital Self - efficacy positively influence employees perception of open innovation culture and this relationship strengthen when digital leaders create a supportive enviornment. Overall, the moderating role of digital self-efficacy suggest that when individuals have confidence in their digital skills and abilities ,it enhances the impact of digital leadership and open innovation.(Lee and Choi 2019)

H7. Digital Self-Efficacy will moderate the relationship between digital leadership and open innovation.

2.11 THEORITICAL FRAMEWORK



2.12 THEORETICAL FOUNDATIONS OF THE PROPOSED MODEL

Theoretical frameworks provide a foundation for understanding and analyzing phenomena within a specific context. In the case of the proposed model, Social Learning Theory serves as a theoretical basis for elucidating the mechanisms through which digital leadership influences employee digital mindsets and subsequently impacts open innovation outcomes. Let's delve into a detailed justification of this alignment, supported by relevant citations.

Modeling and Imitation: Bandura (1977) emphasized that individuals are more likely to adopt behaviors they observe in others, particularly if they perceive those behaviors as successful or beneficial. In the context of digital leadership, employees may model their behavior after digital leaders who demonstrate effective use of technology for innovation purposes. Bandura (1986) notes that "people are more likely to adopt a modeled behavior if it results in outcomes they value," suggesting that successful digital leadership behaviors are likely to be emulated by employees.

RESEARCH METHODOLOGY

3.1 Research Design:

The current research primarily aims to assess the impact of digital leadership on open innovation and the mediating role of digital mindset. Mitchell and Jolley (2010) delineate two fundamental research design approaches: qualitative and quantitative. Quantitative research design, as highlighted by the authors,

offers precision and convenience in data interpretation. Thus, this study adopts a quantitative approach, employing structured questionnaires to investigate the proposed hypotheses.

Building upon a theoretical gap identified in the literature, a theoretical model was developed to test the hypotheses. Consequently, a deductive approach was embraced for this research. Aguinis et al. (2017) assert that deductive techniques enhance methodological transparency in research endeavors. The unit of analysis in this study comprises individual employees working in various software companies located in Rawalpindi Islamabad.

With minimal interference from the researcher, data collection was facilitated, as the study does not necessitate alterations to the natural work environment or routine activities within targeted organizations. As such, the research maintains methodological transparency and adherence to a Positivist philosophy.

Utilizing existing English language instruments for data collection was deemed appropriate, given that English serves as Pakistan's official language, and the majority of the population is proficient in reading, speaking, and understanding English (Naseer et al., 2016). Previous research conducted in Pakistan has successfully gathered data in English, indicating the suitability of this approach.

3.3 Population, Sample Size, and Sample Techniques:

Population refers to the entirety of individuals from whom the researcher gathers data for a study. Defining the population is a crucial step

before initiating data collection. Since the population represents a large group, sampling is necessary for quantitative research, as it would be impractical and costly to collect data from the entire population. For this study, information was gathered from software companies in Rawalpindi Islamabad.

Sampling involves selecting a smaller subset, or sample, from the population. Past studies have recommended varying sample sizes depending on the complexity of the framework. For simple frameworks, a sample size of around 200 is suggested, while for more complex frameworks, a sample size of 300-400 is recommended (Boomsma, 1983). Additionally, Boomsma (1983) proposed that for time-lagged (longitudinal) studies, a sample size of 200-300 is sufficient.

research often recommends a sample size of 300-450 to gather data for complex research models, with 200 (Kelloway, 1998) serving as an approximate minimum sample size for any simple data set (Barlett, korrlik & Higgins, 2001) In the current study, a sample size of 400 was selected. However, only 350 responses were utilized in the data analysis after removing incomplete questionnaires, missing responses, and outliers. Due to resource constraints and time limitations, it was not feasible to collect data from the entire population. Therefore, a non-probability convenience sampling technique was employed, allowing for the random gathering of maximum information from individual employees of different software companies.

3.4 Data Collection Procedure

The current study is quantitative research in which the proposed model and hypothesis were tested by using structured questionnaire the questionnaires were distributed personally to the respondents and approval was taken first from the concerned authorities of the participants. The questionnaire was designed with proper attention for the sake of participants to better understand questions the medium of questions was English as in the past era most of the studies conducted in Pakistan was questionnaire in English

(Raja, Bouckennooghe, Syed, & Naseer, 2018) the questionnaire begin with a cover letter that explains the purpose of the study and ensures the confidentiality of employee responses. existing instruments that are available for the study variable and used in the prior research studies were adopted and all items of this study were self-administered. the questioners was divided in two parts, the first part is the demographic part which contains the demographic details. Gender, Age, Department, Tenure of the Employees, so that it will be easy to segregated responses. The questionnaires were given to the respondents personally and the respondents were taken in confidence to give the responses at three different time lags (T1, T2, T3) at T1, The data was collected for the demographics section and the question regarding the study independent variable and moderator.

3.6 Data Analysis Techniques:

Statistical tools such as SPSS and AMOS were utilized for data analysis and hypothesis testing using the following procedure:

First, the responses collected at three different time intervals were organized and entered into SPSS software. Frequency distribution was then conducted to identify and correct any missing values and errors. Reverse-coded items were converted to their original form, and normality tests were performed.

Next, the Cronbach's alpha reliability for the study variables was evaluated, followed by the computation of the mean for all study variables. A bivariate correlation test was conducted to determine the associations between the study constructs. An Analysis of Variance (ANOVA) test was performed to identify control variables for the study.

To assess the composite and discriminant validity of the study constructs, Confirmatory Factor Analysis (CFA) was conducted using AMOS software. Hypothesis testing was performed using the Preacher and Hayes (2004) process techniques to examine the role of mediators and moderators between antecedent and outcome variables. For mediation, regression analysis using Model 4 was applied,

while moderation analysis also used Model 4 to determine interaction effects. Subsequently, plots were created to illustrate the direction and strength of the moderator variable.

DATA ANALYSIS AND RESULTS

Chapter Overview:

This chapter presents the findings of the proposed mechanism, encompassing the summary of hypotheses, ANOVA results, and data findings. The data analysis includes sample characteristics, confirmatory factor analysis, descriptive statistics, correlation analysis, and mediating and moderating regression analysis. Additionally, the chapter concludes with the results of the hypotheses, indicating whether each hypothesis is accepted or rejected.

Data Coding

Before any analysis was performed using software, the data first needed to be coded. Responses received from employees at different intervals were organized, aligned, coded, and then entered into SPSS software. The study included various demographic questions, which were assigned numerical scores for analysis.

Data Screening

Data screening was conducted using statistical tools like SPSS. This crucial step ensures the data is free from inaccuracies before analysis. Data screening involves examining the data for errors and missing values. After coding the data in SPSS, frequency distribution was used to

identify and correct missing values and outliers. Additionally, reverse-coded items were consolidated back to their original items before further analysis.

4.1 Frequency Distribution

In this current study the researcher characterizes the data in table form to present the data movements. Table No 01 provide the authentic distribution of the demographic variables which are gender, Age, Departments and tenure of the responses.

Present research study, the data is collected from three hundred and fifty valid respondents. Two subcategories of gender Ratio is Male 225 (64.3%) and whereas 125 (35.7%) are female's respondents. Majority of the respondents are male, comprising 64.30 % of the total, while females make up the remaining 35.7 % .There were five subcategories of age, 25 years and below are 103 ((29.4%), 26 years to 35 years were 109 (31.1.%),36 to 45 years were 62 (17.7%),46 to 55 years were 37(10.6 %)and 55 years above were 39 (11.1%) .Five subcategories of departments in which 66.9% from IT Department, Sales and Marketing 10%,HR/Admin 5.7%,Development 10 % , Finance 7.4%, .Six subcategories of Tenure of the Employee 1 to 5 years were 27.7 % ,6 to 10 years 26.9 %,11 to 15 years .28.6 % ,16 to 20 years were 8.3 % percent, 4.6% were 21 to 25 years, and 4 % 26 to 30 are illustrated in table no 01.

Table No 01

Table 1 Frequency distribution of Demographics Variables

Demographics	Frequency	Percent
GENDER		
Male	225	64.3 %
Female	125	35.7 %
Age		
25 and Under	103	29.4 %
26 to 35	109	31.1 %
36 to 45	62	17.7 %
46 to 55	37	10.6 %
55 and above	39	11.1 %

Departments		
IT	234	66.9%
Sales and Marketing	35	10 %
HR/Admin	2	5.7 %
Development	35	10 %
Finance	26	7.4 %

Tenure of Employee		
1 to 5 years	97	27.7%
6 to 10 years	94	26.9%
11 to 15 years	100	28.6%
16 to 20 years	29	8.3%
21 to 25 years	16	4.6%
26 to 30	14	4 %

4.2. Reliability Analysis:

Reliability is a statistical concept that refers to the consistency, stability and reproducibility of measurements or results over time across different situation or observers. Results shown in table No 2 Digital leadership (DL) Cronbach alpha value is .910 which indicates high level of internal consistency of variable. This suggests that the items measuring digital leadership are highly correlated with each other and provide reliable measures of a construct. Digital Mindset

(DMS) The Cronbach Alpha value is .799 indicated moderate level of internal consistency lower than the previous variable, it suggests a good level of reliability. Digital Self Efficacy (DSE) The Cronbach Alpha value of .783 indicates a moderate level of internal consistency. Similarly, to the previous variable, it suggests a reasonably good level of reliability, Open Innovation (OI) The Cronbach Alpha of .827 Indicates a moderate level of internal consistency and suggest good level of reliability.

Table 2 Reliability

Variable Name	Cronbach Alpha Values
Digital Leadership (DL)	.910
Digital Mindset (DMS)	.799
Digital Self -Efficacy(DSE)	.783
Open Innovation(OI)	.827

4.3 Descriptive Statistics

Descriptive statistics involve summarizing and communicating finding about data set. The mean represents the average value of the variable and standard deviation indicates the spread of data around the mean Skewness and Kurtosis are measure of the shape of the distribution with skewness indicating symmetry and kurtosis indicating the peakdness of the distribution.

The mean value for Open Innovation is approximately 4.86, indicating a relatively high

level of perceived openness to innovation among respondents. The standard deviation (0.46) is relatively low, suggesting less variability compared to DMS. The skewness (0.002) and kurtosis (-0.191) values suggest nearly symmetrical and normally distributed responses.

Respondents generally perceive high levels of digital leadership, digital self-efficacy, and open innovation, with slightly lower scores observed for digital mindset. The distributions for all

variables are relatively normal, with some slight deviations noted in skewness and kurtosis.

Table 3. Descriptive Statistics

Variables	Mean	Std.Deviation	Skewness	Kurtosis
DL	4.3289	.44806	-.004	-.189
DMS	3.9877	.62530	.063	-.099
DSE	4.1265	.46975	-.042	.192
OI	4.0862	.45874	.002	-.191

DL=Digital Leadership, MS=Digital Mindset, DSE= Digital Self Efficacy, OI =Open Innovation

4.6 Control Variables:

Controlling variables allows researchers to isolate and examine the specific impact of each variable of interest, ensuring a more accurate and nuanced understanding of the relationship within the data. Demographic variables like age, gender, department, tenure are being controlled for hypothesis testing, in order to identify control factor one-way ANOVA was run

for every single dependent variable, and some of the values were found insignificant. Since ANOVA did not reveal any appreciable differences in our dependent variable (Open Innovation) with respect to demographics, Age, Gender, Department, Tenure, No controls were utilized in the study. Additionally, the study addressed the possibility of endogeneity bias.

Table No 6: One-Way ANNOVA

DV's	Age		Gender		Department		Tenure	
	F	Sig	F	Sig	F	Sig	F	Sig
DL	.697	.594	.087	.769	.875	.479	.790	.557
DMS	4.159	.003	.319	.573	.327	.860	.223	.953
DSE	.452	.771	.085	.770	.329	.859	.751	.586
OI	1.640	.164	.363	.547	.974	.422	.906	.477

4.7 Regression Analysis:

4.7.3 Effects of Digital leadership on Digital Self Efficacy.

The Depending Variable Digital self-efficacy was regressed on the predicting variable digital leadership beta value is .638 which is moderate

positive relationship the p value is less than .005 R-Square is .407 and Adjusted R-Square is .405 The hypothesis is accepted that there is moderate and significant relationship with digital mindset and open innovation. Hence the hypothesis 3 is accepted.

Path DL → DSE

Table 9 Effect on DL on DSE * $P < .001$**

β	Digital Mindset	
	R-Square	Adjusted R-Square
.638 ***	.407	.405 ***

4.7.4 Effects of Digital mindset on open innovation.

The Depending variable open innovation was regressed on the predicting variable digital mindset with controlling the effects of age. At a step 1, the value of R-Square of control variables

is .008 At the second step of the regression the beta value is .589 which is moderate positive relationship the p value is less than .005 R-Square is .347 and Adjusted R-Square is .346

The hypothesis is accepted that there is moderate and significant relationship with digital mindset and open innovation.

Hence the hypothesis four is accepted.

Path DMS → OI

*Table 10 Effect on DMS on OI *** P < .001*

	Digital Mindset	
β	R-Square	Adjusted R-Square
.589 ***	.347	.346 ***

4.7.5 Effects of Digital Self-Efficacy on open innovation.

The Depending variable open innovation was regressed on the predicting variable digital Self-Efficacy w β value is .595 which is positively related the p value is less than .005 R-Square is

.354 and Adjusted R-Square is .352. The hypothesis is accepted that there is moderate and significant relationship with digital mindset and open innovation.

Hence the Hypothesis five is accepted.

Path DSE → OI

*Table 11 Effect on DSE on OI *** P < .001*

	Digital Mindset	
β	R-Square	Adjusted R-Square
.595 ***	.354	.352 ***

Multiple Regression Analysis:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.820 ^a	.672	.671	.26308
2	.834 ^b	.696	.694	.25373
3	.835 ^c	.698	.695	.25335

Model 1: The correlation coefficient (Pearson's r) between the predicted values and the actual values of the dependent variable is 0.820. This model explains 67.2% of the variance in the dependent variable, as indicated by an R Square value of 0.672. The Adjusted R Square, which adjusts for the number of predictors in the model, is 0.671. The standard error of the estimate is 0.26308.

Model 2: This model includes additional predictors compared to Model 1. The correlation coefficient between predicted and actual values increases slightly to 0.834, indicating a somewhat stronger relationship.

The proportion of explained variance (R Square) also increases to 69.6%, while the Adjusted R Square is 0.694. The standard error of the estimate decreases slightly to 0.25373.

Model 3: Similar to Model 2, this model includes additional predictors. The correlation coefficient remains relatively stable at 0.835. The proportion of explained variance increases marginally to 69.8%, with an Adjusted R Square of 0.695. The standard error of the estimate decreases slightly to 0.25335.

Overall, each successive model appears to provide a slightly better fit to the data, as indicated by increases in R Square and Adjusted

R Square values and decreases in the standard error of the estimate. However, the improvements between Model 2 and Model 3 are minimal, suggesting that the additional predictor(s) in Model 3 may not contribute significantly to explaining the variance in the dependent variable beyond those already included in Model 2.

4.8 Mediation Analysis:

For mediation analysis we used PROCESS v.4.2 by Andrew F. Hayes. Number of bootstrap samples for percentile bootstrap confidence interval is sample size 5000 and all confidence interval is 95 Percent. Bootstrapping is a non-parametric resampling method that does not impose the state of data normality, and frequently resampling data to produce confidence intervals. Table No 11 Shows the effects, standard errors (SE), t-values (T) lower

(LLCI) and upper (ULCI) confidence interval for the total effect, direct effect, and indirect effect. The total “effects” refers to the overall relationship between variables in the analysis the value is 0.8393, indicating the positive relationship. The Direct Effect represents the direct relationship between the variables, excluding any indirect effects, it has a value 0.7316 indicating a positive relationship, The Indirect Effect refers to the relationship between variables that is mediated by another variable. The value of 0.1077 suggests a relatively weaker indirect effect. The standard errors (SE) provide a measure of the uncertainty associated with the estimated effects. The t-values (T) indicate the significance of the effects, with larger absolute values suggesting greater significance. All the effects have relatively large t-value, indicating that they are statistically significant.

Hence hypothesis no 6 is supported.

Table no 12 Mediation effect of DMS

	Effects	SE	T	P	LLCI	ULCI
Total Effect	.8393	.0314	26.7053	.0000	.7775	.9012
Direct Effect	.7316	.0367	19.9377	.0000	.6595	.8038
Indirect Effect	.1077	.0268			.0597	.1646

DISCUSSION AND CONCLUSION

5.1 Discussion

The Path of organizational success requires leadership at every stage, and digital leadership has emerged as a noteworthy phenomenon in this regards. An organization must have digital leadership that fosters information sharing and innovation capacity in order to accomplish open innovation. The study contributes to extent research by explaining how digital leaders develop digital mindsets of the employees and how to foster the digital self-efficacy to achieve open innovation that is highly important to compete and outperform the rivals. Based on the results, it appears that the hypothesis related to the moderating role of digital self-efficacy on the relation between digital leadership and open innovation was found to be insignificant. However, it is important to note that the other hypothesis was supported, indicating significant positive relationship between digital leadership

and open innovation and mediating role of digital mindset is positively related, Organizations with effective leadership are more likely to have successful open innovation practices, this study indicates that individual with a positive digital mindset are more likely to contribute to open innovation efforts. This study contributes to our understanding of the role digital leadership, digital mindset, and digital self-efficacy in fostering open innovation. They provide valuable insights for organizations looking to leverage these factors to drive innovation and stay competitive in the digital age.

Major Finding's overview:

According to the results obtained, Digital leadership has a significant impact on open innovation

5.4 Limitations and future research

The study might have limitations in terms of sample size and diversity of the sample future research could focus on expanding the sample size to ensure more representatives and generalizable findings, this study focused on a specific industry or organizational context, which limits the generalizability of the findings. Future research could employ a combination of qualitative and quantitative method to gain more comprehensive understanding of the relationship between digital leadership, Digital Mindset, and Digital self-efficacy. Cross cultural studies investigating cross-cultural aspects of digital leadership and open innovation could help understand how cultural factors influence the relationship between digital leadership and open innovation. Organizational Climate and Support examining the impact of organizational climate and support on the development of digital mindset and self-efficacy among leaders could provide valuable insights into creating an enabling environment for digital leadership and open innovation. Development programs effective intervention to enhance digital leadership capabilities. Innovation Outcomes, Creativity, idea generation, and problem-solving could further enhance our understanding of the relationship between digital leadership and open innovation.

5.6 Conclusion

This study shed light on the important role of digital leadership, digital mindset, and digital self-efficacy in driving open innovation within organizations. Although the hypothesis related to the moderating role of digital self-efficacy was found insignificant in this study, other hypothesis was supported, indicating significant relationships between digital leadership, digital mindset, and open innovation. The findings of this study have important implications for organizations looking to stay competitive and innovative in the digital age. It emphasizes the importance of effective digital leadership, cultivating a positive digital mindset, and developing digital self-efficacy in employees to enhance open innovation initiatives. This research provides valuable insights that can aid organizations in navigating the digital landscape

and encourage them to invest in developing their digital leadership capabilities and fostering a digital friendly culture.

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