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Exploring the Socio-Technical Factors Influencing Organizational Effectiveness in Contemporary Organizations: A Case Study of Information Technology Firms in India

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ABSTRACT

The rapid technological advancements of the past decade have significantly impacted organizational structures, leading to the evolution of socio-technical systems (STS) within businesses. This paper explores the interrelationship between technological innovations, such as robotics, artificial intelligence, and big data, and their social implications within organizational settings. Drawing on the contingency theory of organizations and socio-technical systems theory, the paper investigates how organizations adapt to these disruptive technologies and integrate both technical and social subsystems for effective transformation. While earlier models emphasized the need for balancing social and technical components, recent discussions on sociomateriality theory argue that technology and social systems are inherently intertwined. This study employs a mixed-method research design to examine the social and technological factors influencing organizational effectiveness, particularly in Indian Information Technology (IT) organizations. Phase I of the study, qualitative in nature, identifies key socio-technical factors through personal interviews and analysis using NVivo. In Phase II, a quantitative approach is adopted to assess the impact of these factors on organizational effectiveness, utilizing Structural Equation Modeling (SEM) with AMOS. The findings highlight the critical role of technology in shaping organizational performance and offer insights into how socio-technical interactions can be leveraged to foster organizational success in the digital age.

Keywords: Socio-Technical Systems, Organizational Effectiveness, Disruptive Technologies, Sociomateriality, Technology and Social Interaction, Mixed-Method Research, Indian Information Technology, Organizational Transformation, Robotics, Artificial Intelligence, Big Data.

1. INTRODUCTION

According to the contingency theory of organizations, businesses must adapt and evolve in response to changing environmental factors (Sajjad & Azman et al., 2020; Freeman, 2010). Over the past decade, one of the most significant drivers of organizational change has been technological advancements, which have notably reshaped social dynamics within organizations (Sharma & Behl, 2023).

We now live in what is commonly referred to as the 'digital era', a period marked by the profound influence of technology on society. This era has led to new ways of working and has fundamentally changed the functioning of organizations (Singh, 2021). Despite extensive discussions on the 'future of work', it remains challenging to predict the socio-technical transformations organizations will face, especially with the rise of robotics, artificial intelligence, big data, and other groundbreaking technological shifts. To capitalize on these changes, organizations

need to develop strategies that integrate these technological innovations with their social systems (Govers & Amelsvoort, 2019; Upadhyaya & Mallik, 2013).

Early theories on Socio-Technical Systems (STS) proposed that organizations required a balance of social and technical subsystems to ensure organizational effectiveness (Mumford, 2003). These theories suggest that the interaction between social and technical elements could be either complex or predictable. When social and technical components are isolated, however, it can lead to unpredictability, negatively affecting organizational performance (Hazy, 2006). As a result, socio-technical theory emphasizes the importance of synergizing technology and human expertise to create a cohesive system (Cooper & Foster, 1971; Pasmore et al., 1982).

Furthermore, the Socio-Technical Systems Design Theory (STS-D) developed by Lowlands, has emerged as a leading approach to understanding socio-technical changes in modern organizations (Walker, 2018). This theory highlights that organizations today have become networks of machines and people, constantly interacting and using Information and Communication Technologies (ICT). According to this framework, organizations can be divided into Control Structures (CS) (technology) and Production Structures (PS) (people), which must work collaboratively to execute tasks. The theory also suggests that to navigate change effectively, organizations should design simpler, more interactive networks to ensure the efficient circulation of information, while strengthening control structures to manage change from the outset.

However, this macro-level perspective on socio-technical systems, rooted in systems theory from the Tavistock Institute (Trist & Bamforth, 1951; Emery & Trist, 1969), overlooks the underlying factors that constitute control and production structures and how these elements interact to drive organizational effectiveness. Earlier theories failed to offer a more detailed, "zoomed-in" view of the social and technical factors and their complex interactions within organizations, which can significantly affect organizational outcomes if not properly addressed (Hoe, 2021; Paraskevi, 2019; Hirschey, 2008).

Previous literature has focused on the individual impact of technological factors on social systems, known as the 'individualistic view'. However, in today's digital age, technology is deeply embedded in all organizational processes, making such one-sided discussions inadequate. As Orlikowski's (2010) Sociomateriality Theory suggests, technology and society are inseparable—technology and social systems are mutually intertwined and cannot be understood in isolation (Graham & Rodriguez, 2021; Orlikowski & Scott, 2015a).

Building on this foundation, this research extends past literature by examining the socio-technical factors and their interactions through a mixed-method research approach. In Phase I, qualitative methods are used to define and explore the composition of social and technical factors. In Phase II, quantitative methods are employed to analyze the interactions between these factors and their collective influence on organizational effectiveness. This integrated approach aims to foster mutual relationships between technology and social elements, which are critical to improving organizational performance (Inegbedion et al., 2020; Liket & Mass, 2015).

Organizational effectiveness is considered essential for the survival of any organization (Chen, Sharma, Zhan, & Liu, 2019). The increasing reliance on technology has acted as a catalyst for organizational effectiveness, bringing both opportunities and challenges. This growing need for effective socio-technical integration has become even more critical in the post-pandemic era, where the role of technology is pivotal to maintaining organizational efficiency (Islam, Jantan, Hashim, Chong & Abdullah, 2018; Hatzijordanou, Bohn, & Terzidis, 2019).

The current study sheds light on how the changing social and technological factors, particularly in the Information Technology sector in India, influence organizational effectiveness. The rapid adoption of technology in Indian IT organizations has had a profound impact on their ability to adapt and thrive in the digital era (Marcon, Soliman & Frank, 2022).

To explore these dynamics, the study employs a sequential mixed-method research design. Phase I is qualitative, involving data collection through personal interviews and analyzed using NVivo software. This phase helps identify and saturate the dominant social and technological factors influencing organizational effectiveness. The insights gained from Phase I are then used to inform Phase II, which is quantitative in nature. In Phase II, a research instrument based on the variables identified in Phase I is developed to collect data. This data is analyzed statistically using Structural Equation Modeling (SEM) with AMOS software. The purpose of Phase II is to examine how socio-technical factors influence organizational effectiveness. The findings from both phases are triangulated to provide a comprehensive view of the topic.

2. OBJECTIVES OF THE STUDY

a. To investigate the interplay of socio-technical factors within organizational environments.
b. To examine the impact of socio-technical factors on organizational effectiveness in Indian Information Technology companies.

The objectives of the study were studied through a sequential mixed method design methodology such that:

- To investigate the socio-technical factors that interact within organizational environments: Explored in Phase I of the study using narrative analysis.
- To examine the impact of socio-technical factors on organizational effectiveness in Indian Information Technology organizations: Investigated in Phase II of the study through statistical analysis.

3. LITERATURE REVIEW

A systematic review of organizational effectiveness was conducted with a socio-technical system perspective. An extensive search was done on four management online resources i.e. EBSCO, Web of Science, Scopus, and Science Direct. The aim was to understand (1) provide a comprehensive view of understanding organizational effectiveness, and (2) to provide know-how into a socio-technical perspective on organizational effectiveness. Table 1.1 below has highlighted some of the dominant works in the past.

Table 1.1: Contributions in the past on sociotechnology and organizational effectiveness

Title of the Research	Year and Researchers	Findings
Effects of socio-technical factors on organizational intention to encourage knowledge sharing	2006, Hsiu-Fen Lin, Gwo-Guang Lee	IT support did not significantly affect the three innovation characteristics of knowledge sharing.
Organizational effectiveness supported by technology-enabled coordination, synchronization and optimization	2016, Rowley and Salley	Organizational effectiveness is considered a broader concept than mere organizational performance and includes a range of quantitative and qualitative dimensions. These dimensions encompass specific business outcomes, shareholder value perceptions, competitive capabilities, employee satisfaction and engagement and long-term sustainability.
Sociotechnical and Organizational Factors for Insider Threat	2018, Greitzer et.al •	Sociotechnical factors could be identified as certain deterrents that could even inhibit organizational growth
Analysis of socio-technical factors in business intelligence framework case of higher education learning	2018, Jayakrishnan	Organizational performance framework of socio-technical factors that influence on BI utilization. This study identified sociotechnical factors with observing MIT90s and McKinsey seven (7) S's framework of people (staff, skills, and style), processes (strategy and structure) and technologies (systems and shared values)
How Does Socio-Technical Approach Influence Sustainability? Considering the Roles of Decision Making Environment	2019,Hadi AL-Abrrow, Alhamzah Alnoor, Hasan Abdullah and Bilal Eneizan	the study finds that there is a significant role of ERP as a mediator while relating socio-technical elements and the decision-making environment;
A Socio-Technical System Perspective on Sustainable Organizational Effectiveness: A PRISMA Systematic Review	2020, Ali et.al	It was suggested that a synergy between Social and technical subsystem may result in sustainable organizational effectiveness, effectiveness in context of higher education institutions.
Impact of Employee Involvement on Organizational	2021, Mathew and R	The effectiveness of every organization depends on the work environment, the commitment of

Effectiveness in the Banking Sector in Kerala		employees, job satisfaction, and most Importantly employee involvement and technology plays an integral role.
Organizational Effectiveness: A Critical Review of the Proposals for Conceptualization and Measurement of the construct	2021, Gomide Junior et. al	Organizational effectiveness have focused on socio-technical orientation, market orientation and economic-financial or competitive orientation dimensions.

Research Gap Analysis

Thus, as seen from Table 1.1, organizational effectiveness has been studied as an impact factor that has been measured through various frameworks, which have had a biased treatment, either the social or technology factors have dominated in most of the studies barring a few. Also, the studies lacked the understanding of the way in which social and technology interact together in impacting organizational effectiveness, with certain factors acting as mediating and others having a direct and indirect role on organizational effectiveness which has been bridged in a modelled framework between socio-technical factors and organizational effectiveness. Most of the studies have been quantitative in nature which is another research gap in the study.

The study initiated with certain original variables from the literature review in the past that highlighted the social and technological factors that impacted organizational effectiveness. Amongst the social factors identified as original variables were leadership, organizational commitment, organizational support, governance framework, and technology acceptability which have been discussed in the literature below.

Leadership: Leadership through technology has been addressed by many scholars in the past (Anderson & Dexter, 2000). The impact of technology in leadership support has been the key to the success of technology integration in management (Mohammad, 2021). Many studies in the recent past have addressed the role of technology and its impact on leadership (Harward & Taylor, 2014; Heafne, 2014). Advances in information technology (IT) are providing varied ways of approaching leadership especially women. The IT's potential as a player for facilitating leadership through talent driven approach has been a major contributor (Aldowah et.al, 2017). Visionary leadership has been one of the factors that technology has impacted in leadership (ISTE, 2014). Systemic improvement and supervisory support for a continuous use of information and technology resources has been a major impact of technology on leadership (ISTE, 2014).

Organizational Support: Considering the fact that human resources or organization are the most important resource to an organizational growth, the human resources require support from organizations for their wellbeing (Shoraj & Llaci, 2015). An effective organization requires professionals and motivated persons to prosper (Al-Hawary & AL-Hamwan, 2017). Furthermore, the need for organizational support that manifests from the mutual cooperation among the employees has been found to be very essential. Therefore, a good organizational support creates a warm climate to enhance cooperation within and between the personnel's leading to growth in organizational productivity (Saman & Nasser, 2015).

Organizational Commitment: Organizations are created through human resources it posseses (Alkalha et al., 2012). Attracting and retaining the best talent requires a sense of organizational attachment, but this is easier said than done. One of the major problems that organizations face is the loss of employees in organizations. Loss of employees lead to loss of knowledge and experiences that they have gained over the period of time (Masa'deh et al., 2015b; Obeidat et al., 2017). All the more the role of organizational commitment where employees work dedicatedly and also are not absent-minded most of the time thinking of their own problems and not creating a sense of wellbeing for others in organization. Therefore, organizational commitment is regarded as a crucial and desirable element in employees' behaviour, but one that is seen as elusive in workplaces and organizations (Aladwan et al., 2013). Commitment can be explained as the attachment, identification, or loyalty to the entity of commitment (Singh and Gupta, 2015) For this employees need to be mutually connected within themselves and the organization through mutual trust and credibility.

Governance Framework: The transformation of governance in the age of technology dominated by digital connect has been influenced by a technical standards (Zhang and Miao, 2015; Zhang and Lin, 2017). Governance framework in organizations have been adopted primarily for the purpose of problem solving and achieving stability (Wang, 2018; 2015). Therefore, the modernization of state governance refers to the organizations adaptation to and mastery of a series of problems also in this journey of modernization like privacy and other

challenges that employee complain about (Zhang et al., 2017). The role of technology surveillance for the organizational support is also very important and crucial to maintain organizational safety and ethical practices in organizations (Datta, 2020).

Technology Acceptability: With the growing rise of technology applications in organizations today, it is very important to understand and explore the acceptance of technology and the challenges if any (Khatri et.al 2020). The Technology Acceptance Model (TAM), developed by Davis (1989), was adapted from the Theory of Reasoned Action (TRA) by Ajzen and Fishbein (1980) and tailored to the context of technology acceptance usage and its assimilation in to organizational work frames. The final conceptualization of the Technology Acceptance Model (Davis, 1989; Davis et al., 1989), has two constructs, which are perceived ease of use (PEOU) and perceived usefulness (PU), and these constructs determine a user‘s attitude while accepting to use technology which in turn impacts his intention to use . The research has tried to explore this technology acceptance and attitude as social phenomenon for effective acceptability.

Organizational Efficacy: Engaging the behaviour of employees through socio-psychological relations at the workplace provides a competitive advantage to organizations to increase their efficiency. This results in organizational wellbeing resulting in greater productivity (Kumar, Prasad & Kesari, 2021). The impact of technology on increasing organizational effectiveness has been through collaboration, team effectiveness, effective supervision and controlled resources allocation. The impact of Information Technology on organizations’ services and performance has been examined by many studies (Beckey, Elliot, & Procket, 1996). Although most of these studies have suggested that IT plays a vital role in improving the quality and quantity of information, its potential for adoption and innovation is often uncertain (Mano, 2009). Different firms allocate their resources differently in a way that maximizes their objectives and those firms that allocate more resources on IT perform better than those firms that allocate less resources (McAfee & Brynjolfsson, 2008). Achieving high performance also requires good IT infrastructure supported by good IT management practice (Mwania & Muganda, 2012).

From the above discussions, it can be concluded that the studies in the past revealed that in spite of technology becoming imperative to everyday working in organizations there has been a lack of studies addressing the role of technology in enabling social facets of the organization and the ‘simultaneous’ ways in which they (*viz.* social and technology factors) are impacting organizational effectiveness. As stated earlier the past literature has studied a ‘dominated’ and ‘biased’ approach to either social or technology factors on their impact on organizational effectiveness. However, the Socio-technology as per ‘Sociomateriality’ theory (Orlikowski, 2010) states that technology and society are constitutively entangled that they cannot be treated as unique entities but in unison which the current study has been sensitive about. This was ascertained through the qualitative methodology of research design in Phase I, the narratives helped to transcribe socio-technology as constitutive in nature from the way the interview questions were designed and addressed to the industry leaders that sensitized the constitutive alignment of socio-technical aspects of organizations, and which resulted in many new concepts and variables called ‘re-defined’ variables like social support, technology assimilation, governance, and surveillance that include socio-technical aspects in unison than measuring social or technological factors as unique entities. Also, the lack of empirical support in past literature which again has been a limitation identified from the review of past literature has been addressed in the current study by adopting a mixed method research methodology. All these limitations have been addressed in the current study.

Based on the research gaps identified from the review of literature, the following research questions and the initial conceptual framework (as seen in Fig 1) were presented namely:

- *What was understood by socio-technological factors and organizational effectiveness in Information Technology organizations?*
- *What was the impact of socio-technological factors on organizational effectiveness?*

4. RESEARCH METHODS

The study used a sequential mixed method research design, Phase I of the study was based on qualitative inquiry leading to the identification and confirmation of the constructs and their corresponding measures. The constructs that emerged post Phase I analysis led to the Phase II (quantitative) which involved data collection through survey method. The data in Phase II was analyzed using statistical applications like SPSS and AMOS.

The qualitative phase was based on narratives which were transcripted through interviews conducted telephonically based on certain trigger questions drawn from the research gaps identified during the review of

literature. For the interview, eight senior leaders in Industry identified from top multinationals (belonging to Information Technology companies) in the North India were conducted which lasted for approx. 90 minutes each. Data were collected during this phase using the non-probability sampling method.

The second phase, which was quantitative in nature was based on the research instrument developed from the re-defined variables that emerged from the first phase of the study. Data was collected through an online survey using a random sampling method from 250 respondents working in software development and operational positions at leading Information technology companies in North India.

4.1 PHASE I: QUALITATIVE STUDY

The qualitative phase of the study which constituted Phase I explored the in-depth theoretical and phenomenological understanding of the variables which were identified from the review of the literature on the topic-themed socio-technical factors impacting organizational effectiveness. A set of the trigger and probing questions were developed from the research gaps emerging from the review of the literature. Rigorous interactions with eight senior managers working in leading information technology companies located in IT (Information Technology) companies in North India were conducted and narratives were recorded in the form of transcripts by using electronic recording devices. Interactions were continued as long as there was a complete saturation of qualitative data collection from the respondents. This led to the stage involving qualitative data analysis (QDA).

4.2 IDENTIFICATION OF CONSTRUCTS & MEASURES

The broad-themes and the sub-themes emerging from qualitative data analysis (QDA) (Table 2) were used develop the constructs and their corresponding measure items. These constructs and their measure items (Table 3) were used to develop the research instrument which was subsequently utilized for quantitative data collection during the second phase of the research.

Table 2: Identification of the sub-themes and broad themes during QDA using N-Vivo

Sub-themes identified from Narrative transcripts	**% Coverage from Narrative Transcripts**	**Broad Theme Category**	**Broad Theme Category % Coverage of Source**
Technical assistance	19%	**Supervisor Support (SS)**	91%
Knowledge sharing	20%		
Trouble shooting	18%		
Motivation	12%		
Emotional Support	22%		
Technical assistance	15%	**Co-worker Support (CS)**	87%
Collaboration	18%		
Trouble shooting	20%		
Encouragement	18%		
Emotional Support	16%		
Dependence on one another	17%	**Trust (T)**	81%
Trust on Decisions	10%		
Reliance on co-workers	16%		
Faith on others during projects	22%		
Concern for Trust	16%		
Technology based security	20%	**Governance & Surveillance (GS)**	86%
Privacy at workplace	10%		
Empathy for others on information needs	21%		
Surveillance	23%		
Better view of actions	12%		
IT Connect	23%	**Technology Assimilation (TA)**	90%
IT Coordination	20%		
Explore knowledge	24%		
Knowledge availability	9%		

Connectedness	14%		
Participation	23%	**Organizational Effectiveness (OE)**	92%
Leadership Connect	24%		
Achievement	17%		
Performance Orientation	14%		
Quality enhancement	14%		

Table 3: Identification of Constructs and their Corresponding Measures from QDA

Constructs identified from Broad Themes	**Measures developed from Sub-themes identified from Narrative transcripts**
Supervisor Support (SS)	Our Supervisor provides us Technical support during our work
	Supervisors in our organization facilitate knowledge sharing
	We receive assistance regarding trouble shooting from our supervisors
	Our supervisors motivate us during our work
	We received emotional support from our supervisors
Co-worker Support (CS)	We get technical support from our colleagues
	Our colleagues constantly collaborate with one another during projects
	We receive adequate help from our co-workers during problems
	We get encouragement from our colleagues during work
	Our colleagues give emotional support to us during work
Trust (T)	People in this organization depend on one another
	We have trust on the decisions made by our seniors
	We can rely on our co-workers during work
	We have faith on our co-workers during projects
	People in this organization have high concern for trust
Governance & Surveillance (GS)	We feel secure with technology based tools like camera biometric etc. in our workplace
	We feel technology at time impacts our privacy at workplace
	I feel information exchange has created disclosure of any malpractices in workplace
	People in the organization are empathetic towards each other's information needs
	Our supervisors have a better view of actions at workplace with technology
Technology Assimilation (TA)	People in organization are connected through information flow through technology
	We have better work coordination
	We can better explore knowledge sources and repositories
	We feel no discrimination as knowledge is available to all
	We feel connected at workplace even beyond work teams
Organizational Effectiveness (OE)	All people in organization participate in decision making
	People have better leadership connect
	We are more achievement oriented
	We are more performance oriented
	People are more quality conscious now

The recorded transcripts were fed into N-Vivo 10.0 version for qualitative data analysis (QDA). The analysis (Table 2) resulted in redefining the original variables in to new variables called 'redefined 'variables that were then applied in the Phase II of the study for the development of the revised conceptual framework, validated through quantitative analysis.

The original variables which got redefined (Table 3) after the narratives were analysed in Phase I were as follows supervisor support (SS), Co-worker Support (CS) , Trust (T), Governance and Surveillance (GS) , Technology Assimilation and Organizational effectiveness (OE).

Supervisor Support (SS): The literature identifies supervisory support as a very important factor in the development of the career of an employee in an organization (Wassem et.al, 2019; Baqir and Ahmad,2020). Employees who are encouraged through relationships from supervisors which are supportive perform more effectively (Qureshi & Abhamid, 2017). Although there are studies that have stated the changing nature of the jobs have created more individual onus in organizations (Arthur et al., 2005; Hall, 1996), however human connect through supervisor remains to be irreplaceable (Kim,Mullins&Yoon,2021). Supervisory support could manifest through career enhancing functions like workmanship support, guidance and skill sharing , visibility, and sponsorship, as well as psychosocial functions such as counselling, acceptance, and friendship (Greenhaus et al., 1990; Igbaria and Wormley, 1992). According to organizational support theory (Eisenberger et al., 1986), supervisor support has an impact on employee commitment (Sadiya, 2015).

Co-worker Support (CS): Co-worker is defined as the cooperation extended among the employees under the management it refers to helping attitude, feeling of concern, collaborative willingness (Wang et.al 2021;Chiaburu and Harrison, 2008). Also co-worker support refers to the support given to the new comers in an organization to settle by other employees (Tims & Parker 2020; Babin and Boles, 1996). Healthy coworker relationships have a great impact on performance of organizations (Fortier, Vallerand, & Guay, 1995). According to the Self determinant theory of motivation and personality given by Deci, & Ryan (1995) the psychological needs, competence, autonomy and psychological affiliation enhances the motivation level of employees. Literature in the past have stated that supportive relationships among coworkers, produce worker well-being (Sloan, 2012; Amarnehet.al 2010).

Trust (T): The role of technology in development of trust in organizations is very crucial (Fejerskov & Fetterer 2021). The behavioural traits especially trust in technology acceptance in organizations has been considered a very important parameter (Chiou & Lee, 2021). According to the latest study it has been perceived trust and privacy concern are direct predictors to accept technology (Dhagarra ,Goswami & Kumar,2020). In the digital era, with the advent of disruptive technologies though exponential growth is forseen however the complex issue of myriad of threats the data exposes which an employee handles can impact the organizational repute.

Governance and Surveillance (GS) Jensen (1976) defined corporate governance as the "allocation of resources that affect organizational growth". Recent developments in technology have increased and the ways of awareness at workplace (Flyverbom ,Deibert, & Matten 2019). OECD in 1999 defined the governance as "Corporate governance is the system by which business corporations are directed and controlled". However with rise of technology in business operations the definition of governance and surveillance have evolved also the concept of digital leadership post Covid 19 needs to be explored (Peng, 2021; Lyon,2007). In the modern age of technology advancements, the monitoring of employees behaviours surveillance mechanism through camera and facial recognition technology and biometrics have changed the landscape (Datta, 2021). Employees in reciprocity need to assess the trade-off of surveillance with benefits of security with right to privacy (Mathew, 2019). Also digital identity through surveillance of technology of employees is a major threat forewarned (Weitzberg ,Cheesman & Schoemaker ,2021). As argued 'the humanitarian sector has not developed the calculus to weigh the benefits of digital identity systems against the costs to fundamental rights' (Latonero, 2019).

Technology Assimilation: Technology assimilation is regarded as an important facet of business activities and strategies to implement employee association with organizations (Mishra and Gupta, 2020). The role of technology to help assimilate employees to organizations systems and procedures to provide connected employees is an important business outcome (Bharati, Pratyush & Chaudhury, 2012). According to a study the role of knowledge-based and resource-based views of the firm that influence IT assimilation are (I) association with senior leadership, (ii) connect with employees through information and (iii) connectivity with organisation , these three views have been analysed in the past (Armstrong & Sambamurthy, 1999).

Organizational effectiveness (OE): In an increasingly complex and dynamic world which is inclusive of technology organizations which are continually striving to change and adapt in order to settle themselves for effectiveness in performance (Tayal et.al, 2021 ; Gochhayat et.al, 2017)). Hence, many companies struggle with organizational change projects and fail to realize expected outcomes (Errida & Lotfi, 2021). The 7-S Model of McKinsey consultants, suggested by Thomas Peters and Robert Waterman in the late of 1970s is a frameowrk of

organizational effectiveness which considers variables like strategy, structure, systems, staff, style, skills, and shared values. The role of technology in implementing organizational effectiveness is very critical. The impact of technology on organizational effectiveness has been measured through variables like process variables; structural variables, performance variables; and effectiveness variables (Batra, 2006; Nayak &Mishra, 2005). Management Information Systems (MIS) is the usage of information systems at the operational, tactical, and strategic levels so that businesses are aided in the achievement of goals. In one of the studies conducted to study the effectiveness and efficiency resulting from MIS use (Adonie et.al; 2007), he suggested that organizational effectiveness and efficiency can be assessed by looking at customer service, financial management, and operations management in which technology plays a crucial role.

5. HYPOTHESIS AND REVISED FRAMEWORK

Based on the redefined constructs emerging from the phase I of the study, the following revised conceptual research framework (Fig 1) was presented.

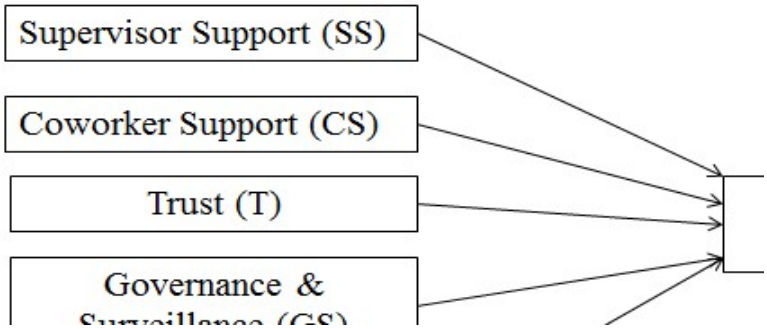

Fig 1: Revised Conceptual Framework with redefined variables (*Based on Qualitative Phase*)

The review of literature conducted before and after the qualitative phase also led to the proposal of the following hypotheses namely:

H_{a1}: *The socio-technological factors namely, supervisor support, co-worker support, trust, Governance & surveillance and technology assimilation has significant influence on organizational effectiveness*

H_{a2}: *The socio-technological factors namely, supervisor support, co-worker support, trust, Governance & surveillance and technology assimilation are interrelated with one another.*

5.1 PHASE II RESULTS AND ANALYSIS (QUANTITATIVE)

The Phase II of the study was quantitative in nature. The data collected in Phase II of the study was through survey. Data collected from the survey were subsequently fed into SPSS 20 and AMOS 20 for quantitative analysis. The sample comprised of a mix of male and female respondents. Out of the male sample, 85% were single while the remaining 15% males were married. Considering the female respondents, 70% of them belonged to the single category and the rest 30% were married (Table 4).

Table 4: Cross-Tabulation of Respondent Gender with Marital Status & Age Group

	Marital Status		**Age Group**		
Gender	*Single*	*Married*	*20 yrs. & below*	*21-25 yrs.*	*26-30 yrs.*
Male	85%	15%	0%	90%	10%
Female	70%	30%	0%	75%	25%

Out of the male respondents, 90% belonged to the age group of 21–25 years, followed by 10% belonging to the age group of 26–30 years. For the female respondents, 75% were of the age category of 21–25 years. 25% represented the age group of 26–30 years (Table 4).

Descriptive statistics of the respondent opinion on the five constructs (Table 5) revealed that among the socio-technological variables; co-worker support had the highest mean score (3.917), followed by governance & surveillance (3.55). This was followed by supervisor support (3.319), trust (3.041) and technology assimilation (2.227). Organizational effectiveness had the mean score of 1.546 (Table 5).

Table 5: Descriptive Statistics & Cronbach's Alpha Scores of the Constructs

	N	Mean	Std. Deviation	Cronbach's Alpha
SS	250	3.3194	.58827	.836
CS	250	3.9174	.56130	.881

T	250	3.0411	.49893	.821
GS	250	3.5501	.71952	.867
TA	250	2.2277	.48387	.872
OE	250	1.5466	.38559	.861
Valid N (list wise)	250			

The Cronbach alpha scores of each of the constructs were well upon 0.7 showing that they had acceptable scale reliability (Nunn ally and Bernstein, 1994; Tavakol and Dennick, 2011).

In order to evaluate the existence of any collinearity issues of the data set before confirmatory factor analysis, the variance inflation factor (VIF) statistics (Table 6) for the constructs were computed. It was found that the VIF scores for all the constructs were above 1 and below 4. A Variance Inflation Factor (VIF) of 1 means that there is no correlation among the j^{th} predictor and the remaining predictor variables. The general rule of thumb is that VIFs exceeding 4 warrant further investigation (Kennedy, 2008; Johnston et al 2018). This indicated that the constructs did not have any issues of collinearity and could be further used for confirmatory factor analysis.

Table 6: Collinearity Statistics

Coefficients								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.073	.149		.486	.627		
	SS	.049	.047	.075	1.042	.298	.488	2.051
	CS	-.047	.045	-.069	-1.044	.298	.582	1.717
	T	.311	.069	.402	4.536	.000	.324	3.090
	GS	.021	.038	.039	.562	.574	.517	1.935
	TA	.213	.068	.268	3.118	.002	.345	2.900
a. Dependent Variable: OE								

Based on the above results (Table 6) as there were no issues of collinearity among the constructs in the data set, the same were fed into AMOS 20 for confirmatory factor analysis (CFA).

5.2 CONFIRMATORY FACTOR ANALYSIS

A measurement model was developed using AMOS 20 with the constructs and the same were subjected for confirmatory factor analysis (Fig 2)

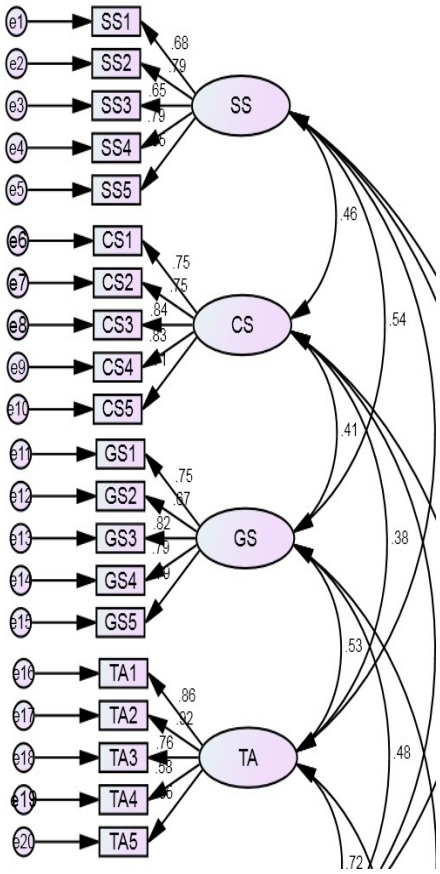

Fig 2: Measurement Model for Confirmatory Factor Analysis

Based on the outputs from AMOS 20, the standardized regression and correlation scores of the constructs and their measures in the measurement model were fed into Gaskin's MS Excel Statistical Tool (Gaskin, 2016) for computing the AVE (Average variance Extracted) and MSV (Maximum shared variance) scores (Lowry and Gaskin, 2014). Table 7 indicated that all the constructs were having adequate AVE scores above the prescribed 0.5 depicting the acceptable convergent validity of the constructs. Further, as the MSV scores of each of the constructs were lesser than the respective AVE scores for each construct, it can be understood that they were all having adequate discriminant validity (Table 7).

Table 7: Convergent & Discriminant Validity estimates for the Constructs

	CR	AVE	MSV	MaxR(H)	T	SS	CS	GS	TA	OE
T	0.801	0.503	0.402	0.850	0.634					
SS	0.839	0.513	0.404	0.850	0.636	**0.716**				
CS	0.885	0.608	0.231	0.893	0.481	0.464	**0.780**			
GS	0.874	0.582	0.295	0.881	0.479	0.543	0.415	**0.763**		
TA	0.874	0.588	0.516	0.918	0.718	0.525	0.378	0.526	**0.767**	
OE	0.861	0.565	0.333	0.906	0.577	0.451	0.284	0.374	0.559	**0.751**

***Model Fit Analysis*:** The model fit estimates (Table 8) extracted from AMOS further indicated that the goodness-of-fit index or GFI (0.897), comparative fit index or CFI (0.882), RMSEA (0.06) were well within the prescribed estimates as suggested by Byrne (2001) and Hair et al. (1998).

Table 8: Model Fit Estimates

Fit Indices	RMR	GFI	CFI	RMSEA	Normed λ^2 (CMIN/df)
Default model	.061	.897	.882	.06	2.106

On the other hand, the normed λ^2 score of 2.106 was also found to be above the acceptable standard. Based on the acceptable estimates of convergent and discriminant validity as well as that of model fit indices, the constructs

were then subjected to structural equation modelling (SEM) using AMOS 20 with organizational effectiveness (OE) as the dependent variable. Whereas the constructs namely, supervisor support, co-worker support, trust, governance & surveillance and technology assimilation on the other hand were fed as independent variables (Fig 3).

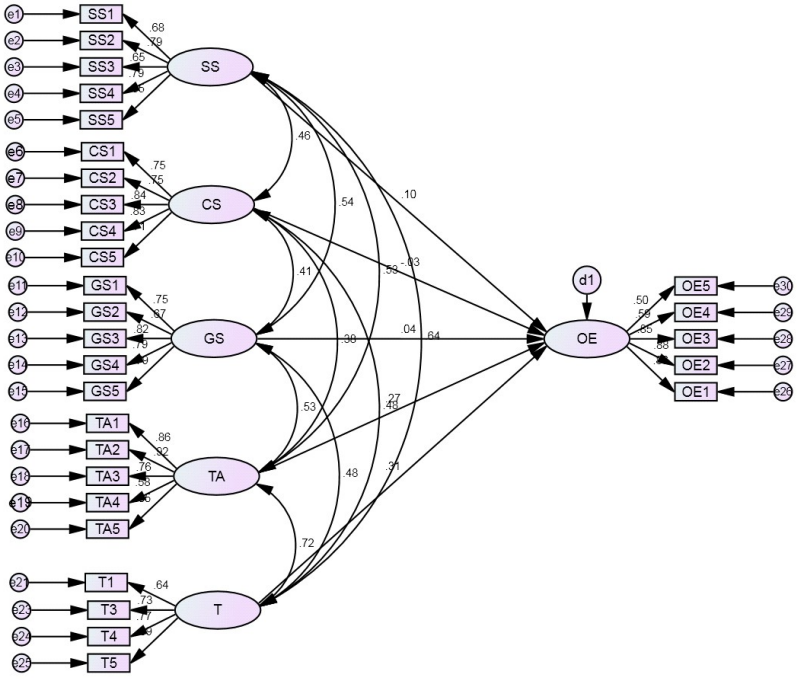

Fig 3: Measurement Model

Regression Estimates and Hypothesis Testing

The regression estimates extracted from the measurement model (Table 9) indicated that the dependent variable organizational effectiveness (OE) had significant relationship with trust (T) (STD β= .313, *p<0.05*) and Technology Assimilation (TA) (STD β= .272, p<*0.05*).

Table 9: Regression Estimates

			β Estimate	**Std β**	**S.E.**	**C.R.**	**P**
OE	<---	SS	.065	.104	.062	1.050	.294
OE	<---	CS	-.023	-.034	.052	-.447	.655
OE	<---	GS	.020	.039	.045	.459	.646
OE	**<---**	**TA**	**.219**	**.272**	**.090**	**2.449**	**.014**
OE	**<---**	**T**	**.233**	**.313**	**.099**	**2.351**	**.019**

The other independent variables namely supervisor support (SS) (Std β= .104, *p>0.05*), co-worker support (CS) (Std β= -.034, *p>0.05*) and governance & surveillance (GS) (Std β= .039, *p>0.05*) did not have any significant relationship with organizational effectiveness (OE). This indicated the partial acceptance of the hypothesis $H_{a1.}$

In order to test the second hypothesis H_{a2} and explore relationships between the independent variables, the covariance estimates of the constructs were extracted from AMOS (Table 10).

Table 9: Covariance Estimates from the Measurement Model

			Estimate	**S.E.**	**C.R.**	**P**
SS	<-->	CS	.176	.036	4.856	***
SS	<-->	GS	.267	.049	5.464	***

SS	<-->	TA	.169	.033	5.149	***
SS	<-->	T	.222	.040	5.606	***
CS	<-->	GS	.187	.039	4.744	***
CS	<-->	TA	.112	.026	4.334	***
CS	<-->	T	.154	.031	4.960	***
GS	<-->	TA	.201	.037	5.483	***
SN	<-->	T	.198	.039	5.035	***
TA	<-->	T	.195	.032	6.039	***

Table 10 indicated that, all the independent variables had significant interrelationships with one another – based on which the first order measurement model was developed (Fig 4). In order to further explore the interrelationships between the independent variables, the regression estimates (Table 11) were extracted from AMOS using the first order measurement model.

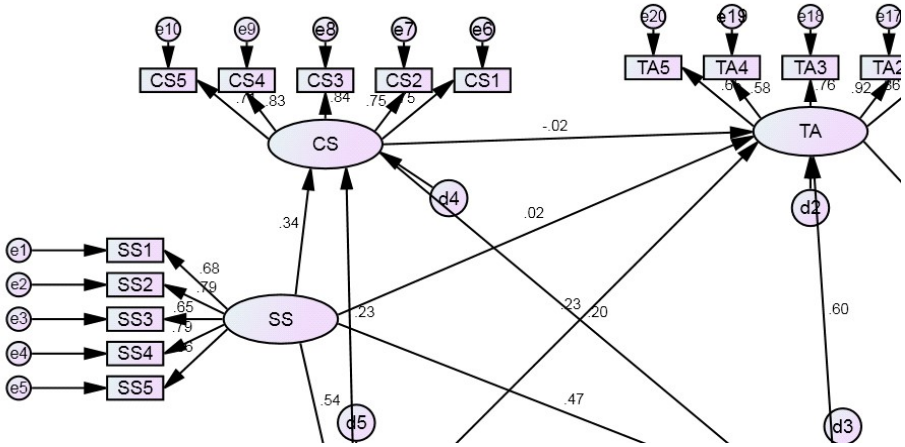

Fig 4: First Order Measurement Model

Table 11: Regression Estimates for the First Order Measurement Model

			β Estimate	**Std β**	**S.E.**	**C.R.**	**P**
GS	<--	SS	.642	.543	.101	6.344	***
CS	<--	SS	.310	.339	.085	3.645	***
CS	<--	GS	.178	.231	.067	2.654	.008
T	**<--**	**GS**	**.103**	**.145**	**.059**	**1.746**	**.081**
T	<--	CS	.185	.202	.072	2.576	.010
T	<--	SS	.395	.471	.084	4.688	***
TA	<--	T	.556	.600	.104	5.337	***
TA	**<--**	**CS**	**-.015**	**-.017**	**.059**	**-.248**	**.804**
TA	<--	GS	.152	.231	.050	3.024	.002
TA	**<--**	**SS**	**.018**	**.023**	**.071**	**.256**	**.798**

OE	<--	TA	.234	.289	.088	2.667	.008
OE	<--	T	.284	.379	.088	3.233	.001

Table 11 indicated that, the independent variables namely governance & surveillance (GS) had no significant relationship with trust (T) (Std β= .145, *p>0.05*). Similarly co-worker support (CS) had no significant relationship with technology assimilation (TA) (Std β= -.017, *p>0.05*). The lack of any significant relationship was also established between supervisor support (SS) and technology assimilation (TA) (Std β= .023, *p>0.05*). Table 11 further indicated significant relationships between supervisor support (SS) and governance & surveillance (GS) (Std β=.543, *p<0.05*); supervisor support (SS) and co-worker support (CS)) (Std β=.339, *p<0.05*); governance & surveillance (GS) and co-worker support (CS) (Std β=.231, *p<0.05*); co-worker support (CS) and trust (T)) (Std β=.202, *p<0.05*); supervisor support (SS) and trust (T)) (Std β=.471, *p<0.05*); trust (T) and technology assimilation (TA)) (Std β=.60, *p<0.05*) and lastly governance & surveillance (GS) and technology assimilation (TA) (Std β=.231, *p<0.05*). These results indicated that the second hypothesis namely H_{a2} was partially accepted. Based on the understandings of the relationships between the independent variables established in Table 11, the first order measurement model was further modified (Fig 5) whereby the relationships between governance & surveillance (GS) and trust (T); co-worker support (CS) and technology assimilation (TA) as well as that between supervisor support (SS) and technology assimilation (TA) were omitted for further considerations.

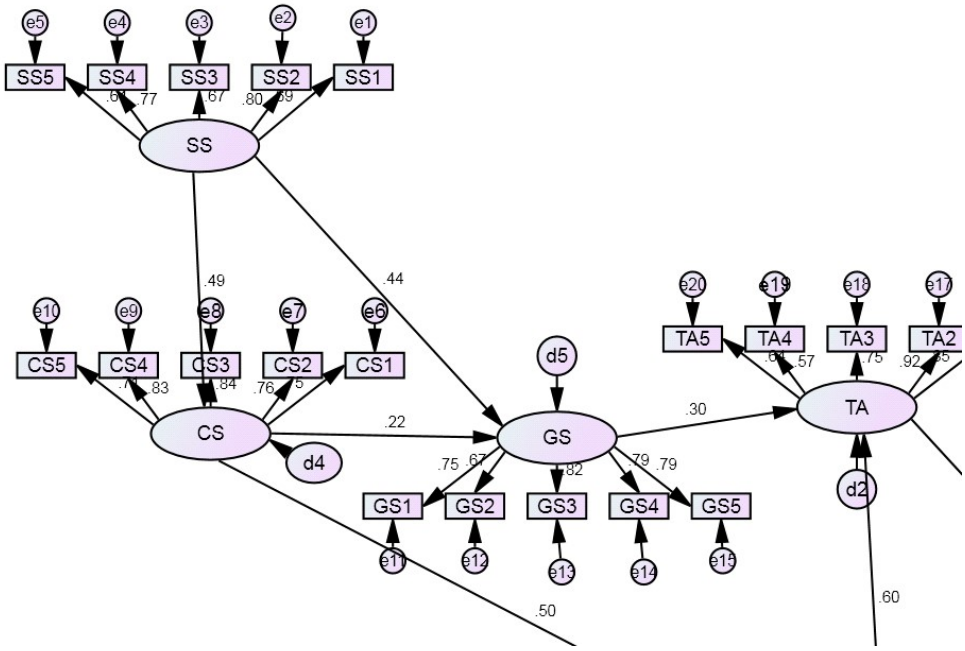

Fig 5: Revised First Order Measurement Model

In order to have a detailed understanding of the relationships in the revised measurement model (Fig 6), regression estimates were computed (Table 12).

Table 12: Regression Estimates from the Revised First Order Measurement Model

			β Estimate	**Std β**	S.E.	C.R.	P
CS	<--	SS	.459	.491	.081	5.653	***
GS	<--	CS	.280	.217	.103	2.725	.006
GS	<--	SS	.527	.438	.109	4.855	***

T	<--	CS	.461	.504	.079	5.875	***
TA	<--	T	.535	.595	.081	6.598	***
TA	<--	GS	.193	.303	.042	4.578	***
OE	<--	TA	.269	.328	.084	3.193	.001
OE	<--	T	.245	.333	.078	3.134	.002

The significant relationships between the variables depicted in Table 12 further facilitated data imputation resulting in the development of the final measurement model (Fig 6).

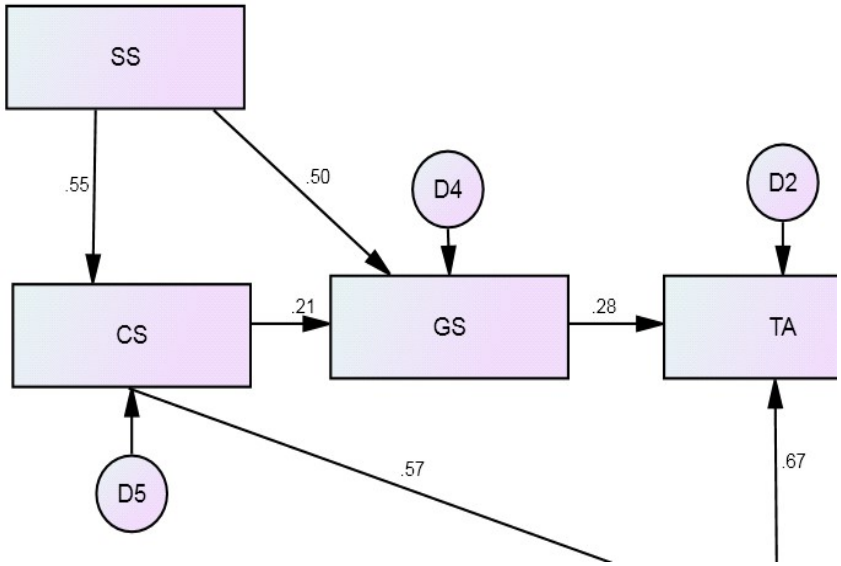

Fig 6: Measurement Model after Data Imputation

Regression estimates (Table 13) of the measurement model developed from data imputation (Fig 7) indicated that governance & surveillance (GS) emerged as an important mediating factor in the empirical model whereas technology assimilation (TA) (Std β=.310, $p<0.05$) and trust (T) (Std β=.388, $p<0.05$) were the most influencing factors leading to organizational effectiveness (OE).

Table 13: Regression Estimates of the Measurement Model developed after data imputation

			β Estimate	**Std β**	**S.E.**	**C.R.**	**P**
CS	<--	SS	.521	.548	.053	9.808	***
GS	<--	CS	.268	.209	.080	3.375	***
GS	<--	SS	.599	.492	.076	7.934	***
T	<--	CS	.501	.567	.049	10.205	***
TA	<--	GS	.184	.282	.028	6.586	***
TA	<--	T	.621	.662	.040	15.429	***
OE	<--	TA	.253	.310	.061	4.133	***

OE	<-- -	T	.296	.388	.057	5.167	***

Regarding governance & surveillance (GS), the empirical model (Fig 7) depicted that the variable mediated the influence of supervisor support (SS) (Std β=.492, *p<0.05*) and co-worker support (CS) (Std β=.209, *p<0.05*) by establishing significant relationship with technology assimilation (TA) (Std β=.282, *p<0.05*). The model also depicted the role of supervisor support (SS) as an important influencer for co-worker support (CS) (Std β=.548, *p<0.05*) apart from influencing governance & surveillance (GS) (Std β=.492, *p<0.05*). On the other hand, co-worker support (CS) had a significant relationship with trust (T) (Std β=.567, *p<0.05*) establishing an indirect influence on organizational effectiveness (OE) routed through trust (T). Further, Trust (T) not only elicited significant relationship with organizational effectiveness (OE) – it also had a significant relationship with technology assimilation (TA) (Std β=.662, *p<0.05*).

Model fit analysis: The empirical model (Fig 7) depicted highly acceptable model fit indices (Table 14) namely GFI (.941), CFI (.943), RMR (.031) and RMSEA (.05) which established the acceptance (Byrne, 2001; Hair et al., 1998) of the model.

Table 14: Model Fit Estimates of the Empirical Mode after data imputation

Fit Indices	RMR	GFI	CFI	RMSEA	Normed λ^2 (CMIN/df)
Default model	.031	.941	.943	0.05	6.513

6. DISCUSSIONS AND CONCLUSION

As seen from Figure 7, supervisor support (SS) was significantly and positively associated with governance and surveillance (GS) (β = 0.55, p < 0.05) and co-worker support (CS) (β = 0.55, p < 0.05) also was positively associated with governance and surveillance (GS) (β = 0.21, p < 0.05). Hypothesis H_{a2} was thus partially accepted. The findings suggest that supervisor support and co-worker support have a positive association with governance and surveillance, which in turn contributes to organizational effectiveness in technologically advanced environments.The conclusion drawn from these findings is that having well-informed and connected supervisors and co-workers is beneficial for organizations, especially those relying heavily on technology-intensive processes like ERP. Such support and connectivity positively impact governance and surveillance efforts, which, in turn, enhance organizational effectiveness (Lisbeth & Shafi, 2020).

Another significant finding has been the role of co-worker support and supervisor support as key factors impacting organizational effectiveness (though as not having a direct but an indirect impact) as seen in Fig 7. In the current study, the researcher has deconstructed the variable social support into two distinct components: co-worker support (CS) and supervisor support (SS). By doing so, it has enabled to differentiate between the sources of social support that employees receive within the workplace. This distinction acknowledges that employees can receive support from both their peers (co-workers) and their immediate superiors (supervisors).By examining co-worker support (CS) and supervisor support (SS) as separate entities, the study likely aims to assess the specific contributions and effects of each type of support on various workplace outcomes, such as job performance, job satisfaction, and employee well-being. This approach can provide a more nuanced understanding of how different sources of social support impact employees in distinct ways (Karasek & Theorell, 1990; Liden et al., 1997; Deckop et al.999; Flynn, 2003) to increase their effectiveness in workplace. Technology has played a very crucial role in the development of networking and relationship building between supervisors and peers through the constant flow of information and constant communication which it provides. This in return benefits the employee behaviour, who then extends this goodwill with the organizations they are associated with (Masterson et al., 2000). With effective technology enabled platforms like ERP and intranet portals supporting chats, discussion rooms which elevate the scope of interaction among employees, they have resulted in greater work output. Also an empathetic support from co-workers while working in teams results in a more conducive environment to thrive and grow for an employee .Though, some employees have stated that privacy of employees has been a major setback due to technology interventions at workplace (Humphrey et al., 2007; Oldham & Hackman, 2010). According to the social contingency theory on social support, it was found that two types of perceived supports, firstly instrumental support (i.e., help on daily tasks) and secondly emotional support (i.e., talking over problems and decision making), are both positively associated with employee wellness (Lin et al., 1999). Extending this theory to current digital age, where employees through technology have greater access to digital communities within organizations,

technology has played an instrumental role in enhancing the social support through increased digital networks. Also, past studies lacked the quantitative validation of the impact of social support in increasing organizational efficiency with the increased use of technology in organizations which has been evident from the model developed (Fig 7) in the current study.

In this extended discussion, the study has identified and highlighted the direct impact of social support, specifically co-worker support (CS) and supervisor support (SS), on governance and surveillance (GS) within the context of the workplace. The results of the study align with previous research, such as the work by Graham Sewell in 2005, which suggested that the social processes of governance and surveillance within organizations have a significant influence on work performance. The concept of "social scrutinization" or the monitoring of work performance through social interactions seems to play a dominant role in influencing how employees perform their tasks. This approach benefits from the social connectedness among employees, leading to heightened awareness of each other's work exchanges. This, in turn, enhances the traceability of peer work performance.Zirkle and Staple (2005) expanded on this concept by introducing the idea of 'ideocultural' responses. Instead of relying on direct monitoring practices like video cameras or biometrics, they suggested that informal social tracking through technology interactive platforms, forums, chats, and other digital means can foster greater work connectivity, awareness, and a positive social environment. This approach, enabled by technology, facilitates information sharing and constant interaction among employees, fostering a healthier work culture.Kulik and Ambrose (1993) emphasized that supervisory control is vital for achieving task completion while maintaining a healthy social environment. They suggested that effective work outcomes result from a combination of well-designed tasks, supervisor supervision, and communication. Another significant consideration is the role of employee trust in supervisory practices. If employees trust their supervisors, monitoring practices are likely to be less harmful and stressful. On the contrary, if monitoring is perceived as invasive and privacy-infringing, it can harm employee productivity (Niehoff and Moorman, 1993).

Next, the findings of the study continue to emphasize the relationships between various factors and their impacts on organizational efficiency. Based on the results, study demonstrates that governance and surveillance (GS) have a significant influence on technology assimilation (TA). This relationship is supported by a beta coefficient (β) of 0.28 with a p-value of less than 0.05. This suggests that effective governance and surveillance practices contribute positively to how technology is integrated and utilized within the organization. Another significant contribution of the study has been that the results indicate that technology assimilation (TA) has a direct impact on organizational efficiency (OE). This relationship is evidenced by a beta coefficient (β) of 0.30 with a p-value of less than 0.05. This implies that the collaborative connections and associations enabled by technology between employees and the organization play a role in enhancing overall organizational efficiency. In summary, the study provides further evidence of the relationships between governance and surveillance, technology assimilation, and organizational efficiency. It underscores the role of social support and effective governance in facilitating technology assimilation, which in turn leads to improved organizational efficiency. This is in line with the conceptual framework presented in your study (Fig 7), offering valuable insights into the dynamics of technology integration and its impact on organizational outcomes.

Analysis further emphasize the interconnected relationships between supervisor support (SS), co-worker support (CS), & trust (T), and their impacts on organizational efficiency (OE). Trust (T) is found to have a direct impact on organizational efficiency (OE), with a beta coefficient (β) of 0.40 and a p-value less than 0.05. This underscores the importance of trust as a critical factor in promoting efficient organizational operations.

7. IMPLICATIONS OF THE STUDY

The study focused on examining the relationship between sociotechnical factors and their impact on organizational effectiveness. By exploring various components of social and technology-related factors, the study aimed to understand how these factors collectively influence the effectiveness of organizations. The study has implications which are summarised has below:

- Identification of Constituents of socio-technical factors that come in play when interacting with technology: The study identified and analysed specific components within both social and technology-related factors. These components included co-worker support, supervisory support, trust, governance surveillance, technology assimilation, and trust.

- **Identification of socio-technical factors that Impact Organizational Effectiveness:** The study investigated how the identified sociotechnical factors individually and collectively contribute to organizational effectiveness.
- **Magnitude of Effect of the soico-technical factors:** The study assessed the strength and significance of the effects of these factors on organizational effectiveness. This assessment could involve quantitative analysis to determine the extent to which each factor influences the overall outcome.
- **Measurement of Direct and Indirect Effects:** The study likely considered both direct and indirect effects of the identified sociotechnical factors on organizational effectiveness.
- **Importance of Social Variables:** The study emphasized the importance of social variables such as co-worker support, supervisory support, and trust. These variables were identified as critical elements that play a role in enhancing organizational effectiveness, especially in the context of technology utilization.
- **Enhancing Organizational Effectiveness:** The study's findings suggest that effective implementation of sociotechnical factors, including social support, trust-building, governance, surveillance, and technology assimilation, can lead to increased organizational effectiveness. This highlights the potential benefits of aligning social and technological aspects within an organization.

In essence, the study's implications underline the interplay between social and technology-related factors and their combined impact on organizational effectiveness. The results emphasize the significance of fostering a supportive work environment, integrating technology effectively, and building trust among employees and supervisors to enhance overall organizational performance(Zhang, Følstad & Bjørkli ,2023; Kompella ,2020) .

The study's conclusions offer practitioners and human resources specialist's insights into the importance of creating a supportive work environment. This involves fostering co-worker support and supervisory support, both of which contribute to building a positive atmosphere where employees feel valued, supported, and engaged. The results of the study bring in light certain need for practices that organizations can leverage through technology-enabled processes through identified socio-technical factors impacting organizational effectiveness. Technology can facilitate the creation of social support networks, enhance communication, and streamline interactions between employees and supervisors (Zein, &Twinomurinzi, 2023).Technology-enabled governance and surveillance tools can play a subtle yet impactful role in building trust. Ultimately, the combination of social support, trust-building, and technology-enabled processes can enhance employee engagement and satisfaction, leading to improved organizational performance and effectiveness.

8. CONCLUSION

The study conducted on sociotechnical factors and their impact on organizational effectiveness identified the constituents of social and technology factors and the ways in which they impact organizational effectiveness. The study concludes by highlighting the fact that technology-enabled approaches, such as providing supervisory control and co-worker support, offer a way to implement effective surveillance without making the process overtly evident. This subtler approach allows for the maintenance of surveillance while still fostering a positive work environment (Ali & Ahmad et.al, 2020).This finding adds an important dimension to the understanding of how technology and social support interact in shaping workplace dynamics, contributing to the overarching theme of your study. The study provides empirical support for the role of technology-enabled platforms in promoting effective social support and co-worker dynamics. The use of technology platforms facilitates communication, collaboration, and support among employees, ultimately leading to increased trust and organizational effectiveness. In conclusion, the study's insights can translate into actionable strategies for practitioners. By focusing on building social support, trust, and implementing technology-enabled practices, organizations can create a harmonious work environment that positively impacts both employee well-being and organizational outcomes.

9. FUTURE SCOPE OF STUDY

The scope of the study currently has been defined through the technology users in Information Technology sector in Indian subcontinent (North India) limiting the generalizability of the study. The future scope of the study would be to validate the model across the businesses in Indian subcontinent considering cultural aspects as another dominant variable in the study. Also, a longitudinal study would further help determine the variations between independent and dependent variables over passage of time which would further enhance effectiveness of the study.

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