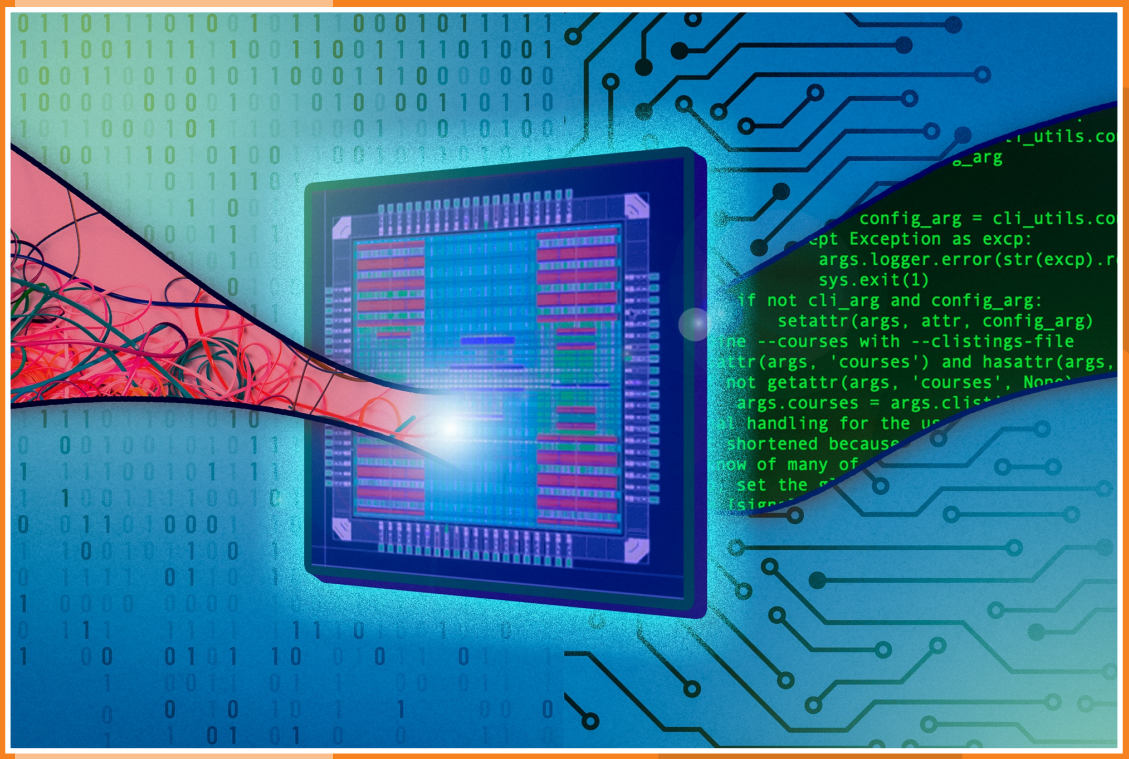
Decoding Stakeholder Experiences in the Digital Age



Editor: Dr. Manjari Srivastava & Dr. Preeti Khanna

SVKM'S NMIMS Deemed to be UNIVERSITY

School of Business Management, Mumbai
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About The Book

The digital era has ushered in a profound transformation in stakeholder experiences across various business domains, necessitating organizations to adapt, analyse challenges, and embrace change. Integrating technological advancements into both business and society is imperative. Transparent and seamless experiences are crucial for organizations to navigate the multifaceted challenge of digital transformation, as outlined by Federico et al. (2020), requiring action on three fronts: culture and skills, infrastructure and technologies, and ecosystems.

Success in this digital landscape is contingent upon collective efforts and collaboration among stakeholders across organizations. Their roles as customers, executives, employees, and partners hold immense significance, as positive experiences fuel digital technologies 'ability to augment performance, efficiency, innovation, and foster appositive work culture (Hess et al. 2016). Recognizing the dual necessity of technology and people is pivotal amidst this transformation.

Ongoing research delves into the influence of digital transformation on businesses and stakeholders. The book, '*Decoding Stakeholder Experiences in The Digital Age*' aims to articulate stakeholder experiences propelled by technological advancements in the digital era, spanning individual, organizational, and societal levels. It will explore facet such as the impact of digitization and remote work experiences, technology's role in supporting wellness and mental health, shifts in work culture and habits, evolving employee and team interactions, as well as skill requirements. Additionally, it will investigate the effects of digitization on supply chains, stakeholder engagement, customer experiences in Fintech, Corporate Social Responsibility (CSR) efforts, and their relevance to society. We invite you to embark on this intellectual journey with us, exploring the past, present, and future of business in the age of technological revolution.

Preface

As we stand at the crossroads of unprecedented technological advancements the narratives in "*Decoding Stakeholder Experiences in The Digital Age*" stands as a comprehensive anthology that navigates the multifaceted impacts of digitalization across diverse industries. Chapters within this compendium unveils a unique facet of the digital transformation, be they consumers, employees, investors, or citizens—navigating the complex terrain of the digital landscape. The narrative offers profound insights into the challenges and opportunities that define our contemporary landscape. The authors, with a keen eye for detail and a profound understanding of the subject matter, delve into the heart of these experiences, capturing the essence of the digital transformation that has become inseparable from our daily lives.

The exploration begins with Chapter 1, delving into the maritime industry's struggles with digitalization and the consequential impact on seafarers. The authors shed light on the delayed integration of digital technologies, raising critical questions about the well-being of those navigating the seas in the digital age. This introspective examination sets the stage for subsequent chapters that venture into the immersive experiences redefining customer-centric approaches across various sectors. Chapter 2 brings attention to the integration of chatbots in various industry in their pivotal role for enhancing user experiences, automating tasks, and improving customer service across multiple industry to handle more complex situation.

In Chapter 3, the focus shifts to the Fintech landscape, where the success of the industry is intricately linked to prioritizing customer experiences. Despite persistent challenges such as trust issues and regulatory complexities, the chapter underscores the pivotal role of personalized, transparent, and proactive experiences in securing a lasting competitive edge. As we go through chapter 4, we find an interesting account of technological advancements, in re-shaping work culture, habits, and interactions in businesses. ICT has accelerated decision-making processes and expanded the reach of industries, giving rise to new opportunities and business models like e-commerce, BPOs, KPOs, and mobile-based services. Chapter 5 examines a few major aspects of the implications of

using ChatGPT in higher education. The chapter also discusses how inclusion of ChatGPT may effect academic integrity and ethical issues.

The subsequent chapters traverse a spectrum of sectors, each delving into the intricate dance between technology and stakeholder experiences.

As we progress, Chapter 6 explores the integration of the Internet of Things (IoT) in the Indian healthcare system, catalysing rapid advancements while grappling with privacy and reliability concerns. Organizational resilience is critical for healthcare institutions to sustain and adapt in the digital era. Chapter 7 explores the multifaceted dimensions of enhancing organizational resilience, focusing on the challenges and opportunities of digitalization. The journey takes an inspiring turn in Chapter 8, where a CSR initiative in Silvassa brings about digital empowerment and visible change within a community, highlighting the potential of technology to drive socio-economic development.

The anthology concludes with Chapter 9, unravelling the intricacies of supply chain management in the digital age. Emphasizing the ongoing efforts to enhance responsiveness and sustainability, this chapter serves as a poignant reminder of the transformative potential embedded in the digitalization of supply chains. Since digital transformation is a continual adaptation to a constantly changing environment, and its goal is to build a technical and operational foundation to evolve and respond in the best possible way at real time to unpredictable and ever-changing customer expectations, market conditions and local or global events. This has been illustrated with a case study of Asian Paints in chapter 10.

Collectively, these chapters emphasize not only the challenges and opportunities embedded in the digital era but also the resilience, innovation, and adaptability required of stakeholders across sectors. "*Decoding Stakeholder Experiences in The Digital Age*" is not merely a compilation of scholarly insights; it is a guide, urging readers to navigate, embrace, and thrive in the transformative epoch that defines our digital future.

Editorial Team

Dr Manjari Srivastava, has an overall experience of more than two decades in the field of business management in various capacities as an academician, researcher and academic administration in business school. Currently, she is a professor of HR and Behavioural sciences at School of Business Management SVKM's Narsee Monjee Institute of Management Studies (NMIMS) Navi Mumbai Campus. She is recipient of the Scholarship from 'Andrew Towl Endowment Fund' for the Global Colloquium on Participant-Cantered Learning GLOCOLL at Harvard Business School, Boston, and attended the faculty development program at Harvard Business School, Boston, US. Her research interests are in the area of leadership, positive psychology, mindfulness, employee voice, managerial and group effectiveness. Manjari Srivastava can be contacted at: manjari.srivastava@sbm.nmims.edu.

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Acknowledgement

The completion of this book stands as a testament to the collaborative efforts and unwavering support of individuals whose contributions have been instrumental in bringing it to fruition. Foremost, our sincere gratitude extends to Hon'ble Vice Chancellor, Dr. Ramesh Bhat, whose steadfast guidance and unwavering support served as the driving force behind the realization of this project. Additionally, we express our heartfelt thanks to Associate Dean, Dr. Mayank Joshipura, whose encouragement, understanding, and unwavering support served as pillars of strength throughout this transformative journey.

Our deepest appreciation extends to our esteemed faculties, readers, and supporters whose engagement and inquisitiveness have fuelled our passion for disseminating knowledge. The opportunity to contribute to the expansive discourse on the multifaceted impacts of technological advancements on businesses, industries, and society is a privilege we hold in high regard.

Lastly, our profound gratitude extends to individuals involved, irrespective of the scale of their contribution. Your collective efforts, no matter how small, have indelibly shaped this book. We sincerely appreciate the collaborative spirit that enabled the realization of this endeavor and extend our heartfelt thanks to each contributor for their invaluable role in making this project a reality.

Thank you,

Editorial Team

Table of Content

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NAVIGATING WORKPLACE STRESSORS: UNDERSTANDING THE DYNAMICS OF SEAFARERS' WELL-BEING IN THE DIGITAL AGE

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Abstract: The enhancement of user convenience is the main objective of digitalisation. Nonetheless, some sectors are still struggling to fully utilize the benefits offered by digitalisation, which is becoming increasingly important globally. The shipping sector is one such industry facing this challenge, with seafarers having to wait several more years before they can fully embrace the advantages of digitalisation. Considering the limited progress in digitalisation within this industry and the presence of various stress-inducing factors in the workplace, this paper seeks to examine the impact of workplace stressors,

specifically workplace loneliness, work-family conflict, stress and fatigue on the subjective well-being of sailors. Considering that financial compensation significantly influences sailors' choice of the maritime sector as a career, the paper also examines if financial compensation mediates the relationship between the identified workplace stressors and sailors' subjective well-being. The research adopts a quantitative research design to empirically investigate the research questions by using a structured questionnaire with a sample size of 521, and the data analysis is conducted using SPSS. The findings indicate that workplace stressors adversely affect sailors' well-being, and income partially mediates the relationship between workplace stressors and subjective well-being.

Keywords: Stakeholder well-being; Digital Era; Workplace Stressors; Seafarers; Workplace Experience.

1. Introduction

The advent of the digital revolution has ushered in profound transformations in the competitive landscape of different sectors, notably in the realm of logistics (Hofmann & Osterwalder, 2017). While the maritime logistics sector has a vital function in global and regional trade, it has not been a forerunner in digitalisation (Raza, 2023). The ongoing process of digital transformation holds promise for bolstering the environmental and financial outcomes of entities within the maritime sector (Lind et al., 2018). However, despite the potential advantages presented by digitalisation, the shipping industry exhibits reluctance when it comes to embracing new digital technologies and fostering innovation, potentially stemming from the technical complexities associated with their implementation (Sanchez-Gonzalez et al., 2019).

Notably, the life of a seafarer is characterized by monotony and routine (Chapman, 1992). They operate in four-hour shifts, during which they often have limited tasks where engineers continuously monitor gauges and consoles (Hafez, 1999) and deck ratings engage in the upkeep of the deck day after day. These shifts of work are accompanied by breaks to unwind, and the cycle persists throughout the sailing months (Oldenburg, Felten, Hedtmann, &

Jensen, 2020). During port stays, seafarers engage themselves in repetitive tasks such as loading and unloading of stores, preparation of cargo holds for loading and unloading, elaborate paperwork, and compliance with various regulations and procedures (Hafez, 1999). Existing literature suggests that merchant seafarers experience heightened levels of stress and strain during port stays and river passages (Oldenburg & Jensen, 2019). Literature suggests that workplace factors can affect the onboard workload and subsequently impact the crew's sleep quality and stress levels (Budiasa, Sara, & Siramiati, 2021). The continuous exposure of ship crews to physical challenges onboard, seven days a week, over several months, underscores the necessity of conducting further research to comprehensively assess the long-term health effects of this lifestyle on seafarers (Oldenburg, Felten, Hedtmann, & Jensen, 2020). Therefore, this lifestyle is inherently linked to inevitable stress and fatigue.

The contrasting realities of life at sea and on land underscore the limited recreational options available to seafarers during rest hours at sea (Sherar, 1973). The physical space is confined on the ship and includes the ship deck, smoke room, mess room, or fellow seafarers' cabins. Social interactions are predominantly limited to interactions with fellow shipmates. In contrast, those working onshore enjoy the liberty to select and manage their work environment, adhering to designated work hours and taking days off to break the routine, effectively creating a separation between their personal and professional lives—a luxury not often afforded to seafarers (Hafez, 1999). The nature of occupation exposes seafarers to feelings of loneliness at sea, fostering an imbalance between personal and organizational goals and often leading to reduced job satisfaction and heightened apprehension regarding failure, work overload, and perceived work stress (Wright, 2005; Firoz, Chaudhary, & Khan, 2020). Given the pervasiveness and adverse impact of loneliness and the limited options for interaction with family, friends, and the outside world in the mobile organizational context, the investigation of workplace loneliness assumes particular significance (Ozcelik & Barsade, 2018).

Research in the field of occupational well-being indicates that job characteristics, including occupation type, occupational prestige, and challenging job profiles, significantly impact overall well-being (Near, Rice, & Hunt, 1980). For sailors, prolonged periods away from home, sometimes spanning several months, lead to work-life conflicts as work-related duties clash with personal life (Edwards & Rothbard, 2000). Extended working hours contribute to conflicts in maintaining a work-life balance (Mäkelä & Suutari, 2011), often necessitating disruptions in regular sleep patterns to facilitate international communication due to varying time zones (Shaffer, Kraimer, Chen, & Bolino, 2012). Considering work and family have been identified as the primary and most important roles individuals hold in life, it would be reasonable to expect that an inability to balance these roles and meet their competing demands may lead to life dissatisfaction.

It is widely acknowledged that at a higher degree of automation, shall lead to an anticipated reduction in workload, as automation can assist seafarers by reducing the time and efforts required for accomplishing tasks aboard a ship. The new ships are equipped with automated controls for loading and unloading systems that can substantially reduce the workload of merchant mariners with minimal human mistakes. However, this equipment has to be maintained as per standard procedures to ensure its reliability, as most seafarers rely heavily on it (Wang, 2012). While the impact of digitalisation on the maritime industry has been predominantly explored from a technical perspective (Ichimura, Dalaklis, Kitada, & Christodoulou, 2022), studies in alternative contexts suggest that digital mental health interventions can effectively enhance psychological well-being and alleviate depression and anxiety. Nevertheless, more rigorous studies are required to ascertain the effective elements of these digital interventions (Lattie et al., 2019).

The association between the well-being of employees and workplace stress factors in the contemporary digital era continues to be an evolving area of study. Advancing the psychosocial well-being of seafarers may yield benefits for both the individual seafarer and their employer, contributing to enhanced well-being and heightened work performance and creating a virtuous cycle of

reinforcement (McVeigh & Maclachlan, 2019). Additionally, the gradual integration of advanced technologies may provide improved medical assistance to seafarers onboard (Nittari, Pirillo, Amenta, & Ricci, 2019). Nittari et al., (2019) suggest the need for a more precise examination of job-related stressors affecting seafarers onboard, proposing the development of occupation-specific health promotion programs. Therefore, this paper endeavours to explore the influence of workplace stressors on the subjective well-being of sailors in the present digital age. Additionally, it aims to explore the outcomes of the financial rewards associated with this sector and the causal relationship between self-reported well-being and stressors at the workplace. Consequently, this research addresses the following research questions:

Research question 1 (RQ1): What is the influence of workplace stressors on the subjective well-being of sailors?

Research question 2 (RQ2): Does financial compensation mediate the association between workplace stressors and subjective well-being?

A quantitative research design is employed to empirically investigate these research questions by using a structured questionnaire, and the data analysis is conducted using SPSS 25.0. The proposed conceptual model is outlined below (Figure 1):

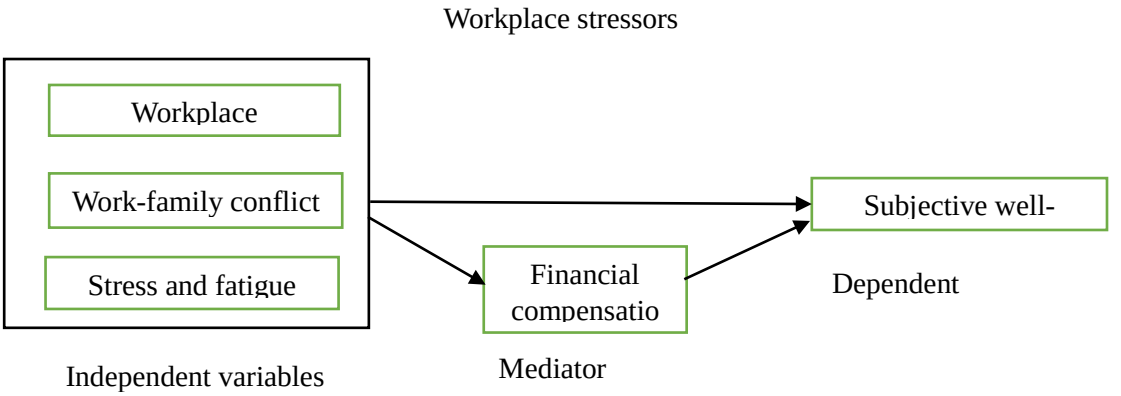

Figure 1. Proposed model

Based on a conceptual map presented in Figure 1, the following hypotheses have been formulated and tested for the study, each trying to understand the relationships between various variables under study. These hypotheses are underpinned by the insights derived from the literature review.

H1: Workplace stressors adversely impact the subjective well-being of sailors.

H2: Financial compensation mediates the causal relationship between workplace stressors and subjective-well-being.

2. Research design

2.1. Respondents

The present research study targets seafarers of Indian nationality and employs random sampling methods. The questionnaire was administered via both the digital mode, i.e., Google Forms and the physical mode, which included the respondents responding to a paper-based structured questionnaire. The survey was distributed to 1077 seafarers, and with 588 responses received, the response rate was 54.11%. The study's control variables encompass a minimum industry experience of 3 years, a minimum sailing experience of twenty-four months, and a sailing duration of at least six months within any fiscal year (April to May). After eliminating incomplete questionnaires, the research sample comprised 521 seafarers of Indian nationality from various levels of expertise, with 43.5% being nautical officers, 33.6% marine engineers, and 23.3% Ratings. The majority of the respondents (61.6%) had 3-10 years of experience. All the respondents were male seafarers, with 243 of them being single, 5 divorced and 273 married. They were employed on various types of ships, including Containers (11.9%), Dry Bulk Carriers (25.9%), Tankers (46.4%) and others (6.2%). The breakdown of experience levels was as follows: 3 to 10 years (61.6%; n = 321), 10 to 15 years (15%; n = 78) and over 15 years (23.4%; n = 122). The distribution of the overall sailing experience was 2 to 5 years (51.4%; n = 268), 5 to 10 years (23.8%; n = 124) and over 10 years (24.8%; n = 129).

2.2. The instrument

The survey instrument designed for the current research was divided into four sections with instructions to direct respondents: Section A of the survey exclusively focused on gathering demographic data from participants, including details such as gender, age, experience in the field of seafaring, rank, company type, and other relevant factors. Section B incorporates workplace stressors, specifically examining workplace loneliness (LAWS - Wright, Burt, & Strongman, 2006), work-family conflict (Carlson, Kacmar, & Williams, 2000), and stress and fatigue, which was self-designed to align with the specific context of the study. Part C of the questionnaire pertains to financial compensation and was self-developed to align with the distinctive context of the current investigation. Section D encompassed items related to subjective well-being, utilizing the validated tool initially developed by Diener, Emmons, Larsen, & Griffin in 1985. These scales were appropriately adjusted to align with the context of this study. The fitness of the data set was thoroughly analysed and normality tests were conducted. The instrument demonstrated an adequate internal consistency coefficient (Cronbach's $\alpha > .76$) (Table 1). The presence of a single factor accounting for 25.653% of variance indicates that common method bias is not a significant concern, as it falls below the 50% threshold (Chang, Van Witteloostuijn, & Eden, 2010).

Table 1**.** Descriptive statistics for scales.

Parameters	Items	Reliability (α)	Skewness	Kurtosis	CMV
Workplace loneliness	16	0.894	.352	.470	25.653
Work-family conflict	5	0.863	.102	.130	
Stress and fatigue	6	0.812	.108	-.041	
Financial compensation	3	0.769	-.246	-.452	
Subjective wellbeing	5	0.849	-0.998	1.690	

CMV: Common method variance.

3. Data analysis

Data was analysed using SPSS software version 25.0 to calculate the means and standard deviations of the parameters of interest. To examine the hypothesized causal relationships between workplace stressors, financial compensation, and subjective well-being, correlation and regression analyses were conducted. Descriptive statistics can be found in Table 1.

4. Results

4.1. Exploratory factor analysis (EFA)

EFA was conducted using principal component analysis. All variables exhibited factor loadings higher than 0.40 (r > 0.30), implying their suitability for inclusion in the factor analysis. However, due to some items having factor loadings less than 0.40 or displaying cross-loadings with other factors, a systematic removal of items was undertaken until an ideal table was achieved. Notably, two items were eliminated from the workplace loneliness scale. The resulting factors were labelled as social companionship and emotional deprivation, demonstrating a Kaiser-Meyer-Olkin (KMO) measure of 0.909 and a significant p-value (p = 0.00).

Similarly, for work-family conflict, all items were retained, leading to the emergence of a single factor with a KMO of 0.858, which was statistically significant (p =.000). In the case of stress and fatigue, all six items were retained, giving rise to one factor with a KMO of 0.853, which was significant (p =.000). Similarly, all three items for financial compensation were retained, resulting in a single factor with a KMO of 0.683, also significant (p =.000). Furthermore, all five items for subjective well-being were retained, yielding a single factor with a KMO of 0.842, which was significant (p =.000). The factor loadings of the exploratory factor analyses are presented in Table 2 for reference.

Table 2. Findings from exploratory factor analysis.

Variable	Number of excluded items	Number of included items	Factors extracted	Variance explained (%)	Cumulative explained variance (%)
Workplace loneliness	2	14	1 (ED)	39.917	39.917
			2 (SC)	12.523	52.440
Work-family conflict	0	5	1 (WFC)	64.783	64.783
Stress and fatigue	0	6	1 (SF)	51.768	51.768
Financial compensation	0	3	1 (FC)	68.934	68.934
Subjective wellbeing	0	5	1 (SWB)	25.488	25.488

SC: Social companionship; ED: Emotional deprivation; WFC: Work-family conflict; SF: Stress and fatigue; FC: Financial compensation; SWB: Subjective well-being.

4.2. Results of correlation and regression between the variables.

Pearson correlation coefficients were calculated to determine the significant associations amongst the variables under study, namely workplace loneliness, work-family conflict, stress and fatigue, financial compensation, and subjective well-being, as outlined in Table 3. All variables demonstrated intercorrelations. As anticipated, there was a negative and significant correlation among the independent variables and financial compensation and subjective well-being ($p < .001$ for a two-tailed test). These correlations were derived from 521 complete observations and ranged from -0.195 to -0.361. The intercorrelations highlighted significant negative associations, among workplace stressors, such as workplace loneliness, work-family conflict, stress and fatigue, financial compensation, and subjective well-being.

Table 3. Correlation coefficients of the variables under study.

	Mean	SD	1	2	3	4	5	6
1. WL_ED	2.087	.7168	1					
2. WL_SC	2.207	.6723	.498**	1				
3. WFC	3.130	.8504	.250**	.150**	1			
4. SF	2.941	.7655	.281**	.264**	.502**	1		
5. FC	3.403	.8110	-.195**	-.249**	-.196**	-.231**	1	
6. SWB	3.452	.7202	-.283**	-.361**	-.301**	-.309**	.469**	1

** Correlations are statistically significant at the 0.01 level (two-tailed).

WL: Workplace loneliness; ED: Emotional deprivation; SC: Social companionship; WFC: Work-family conflict; SF: Stress and fatigue; FC: Financial compensation; SWB: Subjective well-being.

The significant results of the Pearson correlation necessitated an investigation into the correlation between the variables and the same was done using linear regression analysis. The corresponding F and adjusted R^2 values are provided in Table 4. The Durbin-Watson scores, indicating the absence of autocorrelation between the variables, are close to 2.

Table 4. Regression analysis results of independent and dependent variables.

Predictor variables (stressors)	**Dependent variable (Subjective well-being)**	
Workplace loneliness	-.346**	F = 42.746 R^2 = .199 DW = 1.674
Work-family conflict	-.309**	
Stress and fatigue	.042	
Financial compensation	.416**	F = 146.379 R^2 = .220 DW = 1.686

The coefficients presented are unstandardized beta coefficients. (** $p < 0.01$; *$p < 0.05$); DW: Durbin Watson.

Workplace loneliness (β = -0.346, p = 0.00) and work-family conflict (β = -0.309, p = 0.00) were observed to be significantly and negatively associated with subjective well-being. Conversely, stress and fatigue (β = 0.042, p = 0.590) were determined to not be significant predictors of subjective well-being. The collective predictive effects of the independent variables, namely workplace loneliness, work-family conflict, and stress and fatigue, accounted for 19.9% of the variance in subjective well-being (F = 42.746; p = 0.000). Financial compensation was found to be a significant predictor of subjective well-being (β = 0.416, p = 0.000). Thus, hypothesis H1, suggesting that workplace stressors, namely workplace loneliness and work-family conflict, have an adverse effect on the subjective well-being of sailors, is partially supported since stress and fatigue were not found to be significant predictors of subjective well-being.

4.3. Mediation hypothesis testing

The examination of the mediating hypotheses in the data analysis aimed to ascertain the mediator's impact on the relationship between the predictor and criterion variables. Perfect mediation occurs when the predictor variable does not directly affect the dependent variable with the inclusion of the mediating variable, signifying full mediation. Partial mediation arises when the independent variable influences the dependent variable both through the mediating variable and directly. The current analysis is testing the following hypotheses for mediation:

H2: Financial compensation mediates the causal relationship between workplace stressors and subjective-well-being.

The first step is to ascertain if the independent and dependent variables are significant for each other. Since workplace loneliness and work-family conflict were significant predictors of subjective well-being, they were tested further for the mediation effects of financial compensation. However, since stress and fatigue were found to be not significant with subjective well-being, it doesn't satisfy the condition for further testing of the mediation hypothesis. After the addition of the mediator, financial compensation, the indirect effects were

checked for between the independent variables and dependent variables (Hayes, 2009), and the same is presented in Table 5.

Table 5. The mediating effect of financial compensation - association between workplace loneliness, work-family conflict, and subjective well-being.

Hypothesis	Direct effect	Indirect effect	Result
Workplace loneliness -> FC->SWB	-.346**	-.281**	Partial mediation
Work-family Conflict -> FC -> SWB	-.309**	-.146**	Partial mediation

** $p < 0.00$. FC: Financial compensation; SWB; Subjective well-being.

There existed a significant relationship observed between workplace loneliness and subjective well-being. When checking for the mediation effects of financial compensation, there was a standardized indirect effect of -.281 ($p = .000$) indicating the presence of the mediating effects of financial compensation. After adding the mediator, workplace loneliness was still found to be significantly associated with subjective well-being, demonstrating the partial mediation effects of financial compensation. A similar observation was made with work-family conflict and subjective well-being. When checking for the mediation effects of financial compensation, there was a standardized indirect effect of -.309 ($p = .000$), indicating the presence of the mediating effects of financial compensation. After adding the mediator, work-family conflict was still found to be significant for subjective well-being, demonstrating the partial mediation effects of financial compensation. Since stress and fatigue were not found to be significantly associated with subjective well-being, it doesn't satisfy the conditions required to further test for mediation; therefore, the hypothesis H1b that financial compensation mediates the causal relation between workplace stressors and subjective well-being is partially supported (Figure 2).

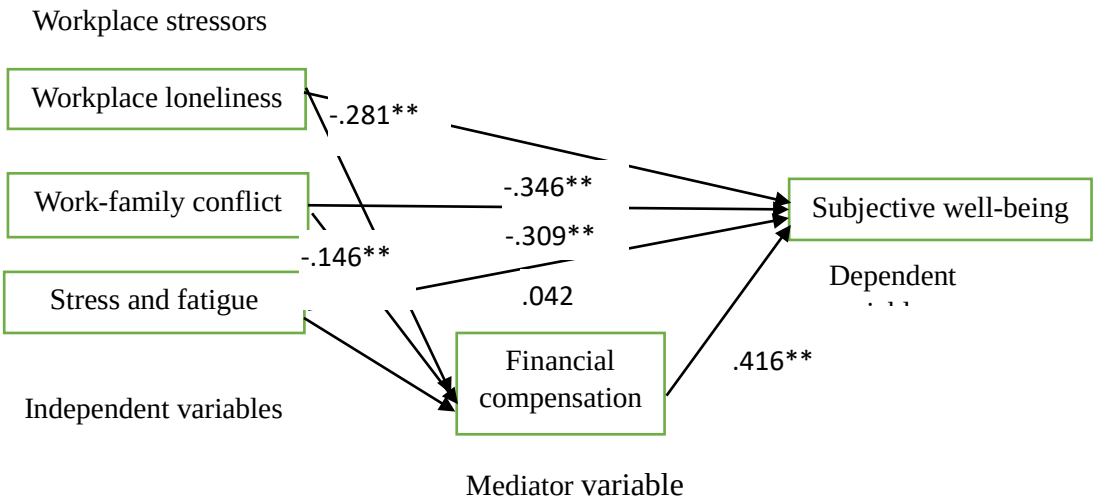

Figure 2. Model with standardized regression estimates.

5. Discussion

The primary objective of the current investigation was to explore the causal relationship between workplace stressors, such as loneliness, work-family conflict, and stress and fatigue, and the subjective well-being of sailors in the digital era. Additionally, the study aimed to assess the influence of financial compensation on the relationship between the independent and dependent variables. The results indicate that workplace loneliness holds significant relevance as a correlate of subjective well-being in the maritime sector. These findings are in line with prior research, highlighting that heightened feelings of loneliness correspond to decreased self-reported well-being. Notably, in the context of organizations, feelings of loneliness can give rise to negative emotions and stress, ultimately affecting employee performance. The study further underscores the compounded impact of workplace loneliness on the subjective well-being of sailors, considering the distinctive nature of their profession in contrast to traditional work environments.

While the term "loneliness" is frequently employed in everyday language, the implications of experiencing loneliness can extend well beyond the immediate perception, as indicated in the existing body of literature. Hence, drawing upon the aforementioned results, it is recommended that organizations take proactive measures to counteract feelings of loneliness and mitigate the

associated consequences. In practice, it is imperative that managers, particularly those in the top four ranks, including the Captain and Chief Engineer, foster favourable social interactions within the crew. This can be facilitated through the organization of social activities such as gatherings, indoor game tournaments, and training sessions focused on enhancing social skills and managing conflicts. In the context of digitalization, establishing online platforms or forums where seafarers can connect, share experiences, and offer support can promote a sense of community and alleviate feelings of seclusion. Providing access to e-learning courses and interactive training modules addressing topics such as stress management, interpersonal communication, and emotional well-being can empower seafarers with essential knowledge and competencies while also promoting participation and personal growth. Granting seafarers access to digital wellness resources, which include mindfulness applications, meditation guides, and relaxation techniques, can aid in stress management, bolster mental well-being, and cultivate a more optimistic perspective while navigating the trials of isolation.

Moreover, work-family conflict also emerged as a significant factor affecting the subjective well-being of seafarers. The intricate demands originating from seafarers, their families, shore teams, charterers, and organizations interlace to create a complex web of requisites. Upon embarking on ships, sailors often grapple with a palpable "relational deficit" or a sense of social isolation, particularly when they require more support than what is typically provided. Generally, organizations tend to view emotional or social challenges, such as loneliness, as personal issues rather than factors that might impact the functioning of the organization (Sekhon & Srivastava, 2019). Elton Mayo's Hawthorne studies also underscored the importance of cultivating positive social relations, establishing the groundwork for comprehending the sources of employee motivation and team dynamics (Bruce & Nyland, 2011). The aforementioned strategies can help alleviate the impacts of workplace loneliness and also attempt to tackle the challenges linked with conflict between work and family. Access to enhanced connectivity, facilitating the use of dependable and effective communication platforms like video conferencing, instant messaging, and social media, can empower seafarers to maintain

connections with their loved ones, nurturing a sense of intimacy despite geographical separation.

The significance of financial compensation with subjective well-being finds support in previous research where income was identified as mediating the influence of occupation on the risk of myocardial infarction, which is related to individual health and considered to be an integral component of well-being (Andersen, Gamborg, Osler, Prescott, & Diderichsen, 2005). The current results suggest that financial compensation partially mediates the association between workplace loneliness, work and family conflict, and subjective well-being. This phenomenon could potentially be attributed to the competitive remuneration offered within the shipping sector, which may surpass the earnings of individuals with comparable qualifications and technical expertise in onshore positions within the current context of the study. Earning potential emerges as a prominent incentive that attracts individuals to the shipping industry, complemented by the allure of exploring new destinations (Sekhon & Srivastava, 2021). Increased income may function as a buffer or safeguard against the negative impacts of workplace stressors. Seafarers who receive better financial compensation might have improved access to resources and support systems that help them cope with the challenges posed by their work environment. This improved access can contribute to a greater sense of well-being despite the presence of workplace stressors.

Surprisingly, stress and fatigue were found to be insignificant with subjective well-being in the present study. This could be due to the acceptance of the fact that stress and fatigue form an integral part of most jobs whether on sea or shore. This was also supported by literature where studies indicated that acceptance has a positive effect on fatigue and psychological aspects of well-being (Damme, Crombez, Houdenhove, Mariman, & Michielsen, 2006). Another potential explanation for this might be the resilience and coping mechanisms developed by seafarers to manage the inherent challenges and demanding nature of their profession. Over time, seafarers may have adapted to the stressful conditions and developed effective strategies to manage the fatigue and stress linked with their work.

6. Conclusion

In conclusion, the seafaring profession is fraught with numerous demanding challenges, including constraints on leaving the workplace, restricted living environments, communication limitations with multinational crews, exposure to harsh environmental conditions, extended durations far from home, and coping with the perpetual motion of the workplace. While some of these challenges are adaptable or manageable, others are inherent to the nature of the industry. Therefore, identifying crucial work domain factors that contribute to subjective well-being can serve as a basis for implementing strategies and interventions to mitigate the adverse effects of identified workplace stressors on seafarers' well-being (Hetherington, Flin, & Mearns, 2006).

This study notably highlights the significance of workplace loneliness and conflict between work and family domains as the foremost predictors of well-being. This underscores the importance of prioritizing interpersonal relationships, thereby aligning with the Theory of Belongingness, which accentuates the significance of interpersonal connections among organizational members. Moreover, while it is essential to examine workplace stressors in vulnerable groups, such as sailors in this study, it is equally crucial to investigate the factors impacting the choice of this profession, among which financial compensation plays a substantial role in influencing the subjective well-being of the seafarers. It is crucial to acknowledge that subjective well-being is a multifaceted construct affected by various factors beyond the scope of workplace stressors alone. Personal and social circumstances, overall job satisfaction, work-life balance, and individual outlooks may all contribute to the subjective well-being of seafarers. Considering these complex interplays, further research may be warranted to explore the nuanced relationships between stress, fatigue, and the overall subjective well-being of seafarers, accounting for these potential moderating variables.

Additionally, the influence of other intervening variables or moderating factors that were not explicitly considered in this study could have affected

the association between stress, fatigue, and subjective well-being. Factors such as individual differences in coping styles, personal resilience, social support networks, and psychological well-being may play a pivotal role in mediating the impact of stress and fatigue on subjective well-being. Furthermore, future research endeavours might expand the scope to include additional stressors and explore how digital advancements can be utilized to mitigate and manage the impact of these stressors.

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FUTURE OF PERSONALIZED CONSUMER EXPERIENCES: THE CHATBOTS JOURNEY

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Abstract:
The rapid proliferation of chatbots, exemplified by ChatGPTs, has ushered in a transformative era. Chatbots are poised to be a central focus of study, drawing the interest of developers, policymakers, government, organizations, businesses, and tech companies. The motivation for this study lies in their pivotal role in enhancing user experiences, automating tasks, and improving customer service. Chatbots excel in specific contexts, such as one-attribute, information-light, and group-buying scenarios. At the same time, traditional apps are preferred for multi-attribute and information-intensive tasks—the amalgamation of technical sophistication and mainstream adoption positions chatbots as influential tools. Researchers, academicians, and developers are

uniquely poised to explore and innovate in this dynamic field, addressing the challenges and opportunities that lie ahead in reshaping human-computer interactions.

Keywords: chatbots, conversational agents, artificial intelligence, user experience, challenges and solutions

1. Introduction

In recent years, chatbots, or conversational agents, have experienced a remarkable surge in popularity and growth, evolving into a transformative force across various industries. These computer software applications, driven by Artificial Intelligence (AI) and Natural Language Processing (NLP) techniques, simulate human communication by responding to voice commands, text dialogues, or a combination of both. The journey of chatbots has traversed from their inception with the groundbreaking creation of Eliza by MIT professor Joseph Weizenbaum in 1966 to the contemporary era featuring advanced platforms like Alexa. Notable chatbots, including Elixa, Parry, Dr. Sbaitso, Siri (introduced in 2011), Google Assistant (launched in 2016), and Alexa (released in 2014), have marked milestones in this evolutionary process, leveraging techniques such as Machine Learning (ML), Natural Language Understanding (NLU), and Speech Recognition (Apple, 2022; Google, 2022; Amazon, 2022).

In the industrial domain, chatbots catalyze transformation through innovations like the collaboration between Capgemini and a global manufacturing client. Developing a conversational user interface aims to empower plant floor supervisors with real-time data analysis from sensors and factory systems, aiding them in maintaining product quality. This user-friendly interface, supporting voice and text interactions, enables seamless communication, even in environments where multiple machines may require simultaneous monitoring (Capgemini report, 2023). The customer service sector is undergoing a paradigm shift, as chatbots provide businesses with the opportunity to augment or replace human customer service representatives in underperforming areas, all while enhancing the overall customer experience.

With the increasing demand for self-service and instant responses, chatbots establish a 24/7 multichannel communication network, meeting the expectations of today's end users with efficiency and empowerment.

As AI technology advances, chatbots are expected to become more sophisticated and capable of handling more complex tasks and interactions. Chatbots have the potential to be a game-changer for businesses by automating various customer service tasks, lead generation, and sales processes, which results in significant operational cost reduction and enhanced efficiency. These conversational AI tools can offer personalized experiences to customers, leveraging their preferences and past interactions to boost customer satisfaction and loyalty while collecting valuable data for targeted marketing and product development. Providing a new user experience, cost savings, gaining a digital footprint and reputation building, meeting user expectations, and opening a new channel of communications are the top drivers for chatbot adoption (Ukpabi et al., 2019).

Few studies have been done related to chatbots in recent times. Liu et al. (2020) delved into the domain of customer service intelligent chatbots, introducing a multi-turn response triggering model designed to rectify issues associated with inappropriate responses and misleading information within conversational dialogues. Their work underscores the significance of optimizing chatbot response mechanisms to elevate the quality of user interactions. Sarbabidya and Saha (2020) focused their study on the banking industry, scrutinizing the pivotal role of customer service and emphasizing the potential of online banking solutions to propel business growth and development. In the financial sector, chatbots have emerged as invaluable additions, streamlining customer interactions and support. Kasinathan et al. (2020) aptly acknowledged the universal applicability of chatbots across multifarious domains, emphasizing their inherent value as tools capable of dispensing assistance autonomously, reducing the dependence on human intervention. This recognition underscores the versatility and cross-industry applicability of chatbot technology. Prabu et al. (2020) rendered a significant contribution to the customer service sector by proffering a proposition for the integration of artificial intelligence (AI) chatbots, enabling the provision of expedited and optimized solutions. Their work aligns harmoniously with the

prevailing trend of leveraging AI-powered chatbots to augment operational efficiency within customer support processes. Sheehan et al. (2020) conducted an in-depth exploration into the intriguing interplay between miscommunication and the acceptance of customer service chatbots by end-users. Their research underscored the imperative of addressing unresolved errors to mitigate anthropomorphism and elucidate the primary rationale behind adopting chatbots. It underscored the paramount role of effective communication within this context.

2. EVOLUTION OF CHATBOTS

Early 1950s-1990s: The journey of chatbots commenced in the early 1950s with the introduction of the Turing Test by Alan Turing. This crucial experiment sought to determine whether a machine might demonstrate intelligence on par with a person. The first chatbot, ELIZA, was developed in 1966 by Joseph Weizenbaum at MIT. It was revolutionary because it could mimic conversations using pattern matching and preprogrammed responses. ELIZA generated pre-programmed responses by identifying specific words and phrases. During this period, other early chatbots were developed, such as PARRY, an early attempt to create a chatbot that could mimic human behavior. PARRY was created to simulate a person with paranoid schizophrenia (Bhattad, H., & Atkar, M. G., 2021).

1990s-2000s: Chatbots have become increasingly sophisticated in the late 20th and early 21st centuries. Developed in the mid-1990s, ALICE (Artificial Linguistic Internet Computer Entity) was one such example. ALICE employed AIML (Artificial Intelligence Markup Language) and natural language processing to improve the caliber of its dialogues. Jabberwacky and Dr. Sabaitso, two more sophisticated chatbots that could handle more complicated conversations, were also introduced during this time, signaling a major shift from rule-based systems to more data-driven and AI-powered chatbots.

2000-2010: In the first ten years of the twenty-first century, chatbots were used in internet services and customer care. The more advanced chatbots A.L.I.C.E. (created in 1995) and Smarterchild (released in 2000) were able to accomplish a

variety of jobs. Voice-based chatbots gained popularity after Apple released Siri in 2010. During this time, mobile devices and the internet were widely used, which made it easier to include chatbots in many apps and turn them into a necessary component of digital communication (Zemčík, M. T., 2019).

2010-2020: Chatbot technology has advanced significantly during the past ten years. Chatbots with AI capabilities, such as Alexa, Cortana, and Google Assistant, are becoming commonplace. These chatbots can do many things, such as play music, create reminders, do internet searches, reply to voice requests, and more. They are often powered by machine learning and natural language processing. Companies like Facebook launched chatbot platforms, enabling businesses to automate customer interactions through messaging apps. Chatbots found applications in various domains, including customer support, e-commerce, personal assistance, and entertainment.

2020-Future: The future of chatbots looks promising with advancements in AI and machine learning. The global conversational AI market, including chatbots and intelligent virtual assistants, is expected to grow significantly. In the future, chatbots are expected to undergo several transformative changes. They will evolve into more conversational entities, shedding their robotic nature and offering interactions that closely mimic human conversations. This evolution will also encompass multilingual support, voice-enabled chatbots, and emotionally intelligent chatbots capable of discerning and responding to human emotions. They will transition from simple user-based queries to sophisticated real-time conversations driven by predictive analytics and find integration with IoT devices for improved automation and personalization. Across diverse industries, chatbots are anticipated to play an expanded role, from scheduling appointments to delivering round-the-clock customer support. The future also holds payment-enabled chatbots that streamline user transactions and leverage advancements in natural language processing to better comprehend and engage with complex human language, offering more personalized marketing (Osuch, 2022; Murphy, 2023).

3. Chatbots Across Diverse Industries

In India, chatbots have closely followed global trends and innovations, positioning the country as one of the fastest-growing markets for chatbot adoption. This remarkable growth can be attributed to several key factors. First, the increased use of smartphones and mobile internet has greatly aided the broad adoption of chatbots since India's high smartphone penetration rate offers an ideal environment for these virtual assistants. The growing need for digital services and solutions in various industries is also fueling the adoption of chatbots. A significant contributing factor has been India's vast linguistic diversity since chatbots have been produced in several regional languages and dialects, increasing their accessibility to a wide range of users. Moreover, the rise of specialist organizations and startups providing platforms and solutions for chatbots has expedited the expansion of the chatbot ecosystem in India. Table 1 illustrates an extensive description of the various uses of chatbots in various industries, highlighting their features with related examples and case studies from India and other countries.

Table 1: Chatbots across diverse industries

Industry	**Function of Chatbots in the Industry**	**Examples**	**References**
Healthcare	Health information, diagnosis, appointment booking, symptom checking, and more	Companies like HealthTap and Babylon Health use chatbots to provide health services.	Athota et al., 2020
Education	Interactive learning content, quizzes, academic administration tasks, feedback, and more	Universities like Arizona State University have used chatbots to support students with course enrollment and administrative functions.	Colace et al., 2018
Travel	Travel information, flight booking, hotel reservations, car	Travel agencies like Expedia and Kayak utilize chatbots to assist travelers	Pillai & Sivathanu, 2017

	rentals, tourist attractions, and more	with bookings and inquiries.	
Banking	Account information, balance inquiries, transaction history, bill payment, money transfer, and more	Private sector banks, such as Erika from Bank of America, EVA from HDFC, and Ceba from Bank of Australia, utilize chatbots to respond to customer inquiries and give customers access to financial services and information.	Copulsky, J., 2019
Entertainment	Games, stories, jokes, songs, images, and more	Entertainment companies like Ruuh provide users with chatbots for engaging conversations about music, fashion, sports, and entertainment.	Brandtzaeg, P. B., & Følstad, A., 2017
eCommerce	Product information, order tracking, payment processing, feedback collection, customer support, and more	E-commerce giants like Flipkart use chatbots to help customers with various aspects of their shopping experience.	Li, M., & Wang, R., 2023
Government	Information dissemination, public services, data utilization, assistance, and more	Government bodies like the Karnataka government have partnered with startups to establish chatbot platforms, and the Indian government has used chatbots for COVID-19 information.	Tran et al., 2019; Androutsopoulou et al., 2019
Service Settings	Customer service and support,	Various businesses use chatbots for customer	Johannsen et al., 2018; Gupta et al.,

	providing assistance, answering inquiries, and more	service, assisting customers in product selection and answering FAQs.	2015

4. Classification of Chatbots

Indeed, multiple categories of chatbots are prevalent in today's businesses, each serving specific purposes and catering to different industry needs. These categories can be classified in the following manner based on their use cases:

Rules-Based Structured Chatbots:

Structured chatbots are user-friendly, often embedded on websites as chat widgets, presenting predefined options or buttons for streamlined interactions. These chatbots are commonly used for tasks like FAQs and essential customer support, simplifying the user experience. They guide users through a menu-based, decision-tree logic, which is most effective for straightforward tasks. Implementation involves scripting languages and web development tools, but their scalability is limited when dealing with complex conversations or diverse user queries. Structured chatbots encompass both the menu or button-based approach and rules-based functionality. They incorporate if/then logic to determine responses based on specific commands or keywords, providing more flexibility than menu-based chatbots. Their interactions are responsive to predefined rules and conditional logic, often employing if/then statements. This approach suits well-defined use cases, such as providing product information, handling common inquiries, and automating specific processes. However, they may face challenges with nuanced or open-ended questions, as they are primarily designed for structured tasks (Redeca, S., & Groza, A., 2022).

Keyword-Driven Informational Chatbots:

These chatbots are helpful for jobs like delivering menu options, accessing specialized data, and providing weather updates since they are competent in identifying keywords or phrases in user input to initiate predefined responses (Vaswani et al., 2017). To find pertinent keywords and produce appropriate responses, they rely on keyword-matching algorithms. This method works

very well for tasks where keywords convey user intent; however, it is not as scalable for queries that are more complicated or open-ended. This category encompasses chatbots that retrieve specific information from multiple sources, such as web scraping or APIs and provide up-to-date information on news, stock market statistics, and sports scores. These chatbots are renowned for their scalability, effectively providing real-time data to a vast user base and meeting various information needs despite the constraints of keyword recognition.

Machine Learning Chatbots:

Powered by machine learning algorithms, these chatbots can understand and respond to a broader range of user queries (Suta et al., 2020). They learn from previous interactions to improve their responses over time. Google's Assistant and Apple's Siri are prime examples, as they adapt to users' preferences and provide context-aware responses. The User Interaction elements of these chatbots are particularly noteworthy, as they use machine learning and natural language processing (NLP) algorithms to understand user input and generate responses. Their reasoning is based on statistical models trained on large text datasets to predict appropriate responses based on context. They are suitable for various use cases, from chat support and virtual assistants to content production and language translation, because of their flexibility and agility. For model training and smooth chatbot platform interaction, machine learning frameworks such as TensorFlow or PyTorch must be employed in their implementation. They are unique because of their scalability, which allows them to progress and adapt to human input constantly. This makes them perfect for dynamic, ever-changing activities.

Hybrid Chatbots:

To provide a more complete experience, hybrid chatbots integrate features of rules-based and machine-learning chatbots. They can deliver individualized responses, grasp the context, and recall previous contacts. As an illustration, consider a virtual assistant that employs rules for simple tasks but leverages machine learning for more complicated ones. By combining rule-based elements for organized work with machine learning for handling complicated

and contextual interactions, these chatbots excel at user engagement. Their Logic combines rule-based decision trees and machine learning models dynamically to ensure they can offer thorough solutions. They are especially well-suited for Use Cases where the chatbot must manage various activities, from simple, automated interactions to complicated, personalized ones, like virtual assistants with dynamic capabilities. Implementing such chatbots requires the seamless integration of rule-based systems and machine-learning components within the chatbot architecture (Gapanyuk et al., 2018). Their scalability and adaptability make them an excellent choice for a broad range of tasks and user interactions, offering both efficiency and flexibility.

Voice Bots:

Voice bots interact with users through spoken language rather than text. (Kaur et al., 2020). Amazon's Alexa, for instance, can control smart home devices, answer questions, and perform tasks through voice commands, providing a convenient, hands-free experience. Voice bots engage in User Interaction through voice commands, typically via smart speakers, smartphones, or other voice-enabled devices. Their Logic hinges on automatic speech recognition (ASR) to transcribe spoken language into text, followed by natural language understanding (NLU) to process and interpret user intent. These chatbots are commonly used for various Use Cases, including controlling smart home devices, answering general knowledge questions, setting reminders, and offering hands-free assistance. Developing voice bots entails working with ASR and NLU systems, utilizing cloud-based voice recognition services, and integrating with voice-enabled platforms like Amazon Alexa or Google Assistant. While they can effectively scale and adapt to various voice patterns and accents, they require continuous training to improve their accuracy, especially in understanding user inputs.

Transactional Chatbots:

These chatbots specialize in completing specific tasks or transactions. For instance, a travel booking chatbot can handle flight reservations, hotel bookings, and car rentals seamlessly. They streamline processes and save users time without human intervention. Transactional chatbots are purpose-built for User Interaction focused on completing specific tasks or transactions,

whether making reservations, booking tickets, or processing financial transactions. Their Logic involves seamless integration with external systems or APIs, enabling them to facilitate and execute transactions effectively. They find extensive use in various industries, including e-commerce, travel booking, banking, and customer service, where they play a pivotal role in automating transactional processes. Implementing these chatbots requires integration with payment gateways, booking systems, or backend databases to ensure secure transaction processing. They exhibit excellent scalability, making them particularly efficient for businesses, as they can handle repetitive and high-volume transactions with ease and reliability (Reshmi, S., & Balakrishnan, K., 2018).

Conversational Chatbots:

Conversational chatbots use natural language processing (NLP) to engage users in human-like conversations. They excel in customer service, virtual companions, and social interactions. OpenAI's GPT-3 is a notable example, capable of generating human-like text responses and holding meaningful conversations. Conversational chatbots are designed to emulate human-like conversation, interacting with users through natural language inputs and generating context-aware responses. Their Logic relies on advanced natural language processing (NLP) models, often based on transformer architectures, which enable them to comprehend context and generate coherent responses. These chatbots are particularly well-suited for Use Cases that demand engaging, human-like interactions, such as customer support, virtual assistants, and chat-based applications. Their implementation necessitates using NLP frameworks like spaCy and NLTKTK or advanced AI models like GPT-3 or GPT-4, frequently deployed in the cloud. (Borji et al., 2023) While they can scale to handle complex and varied conversations, doing so may require substantial computational resources due to the complexity of the underlying NLP models.

ChatGPT: Revolutionizing Chatbots and Shaping Conversational AI

OpenAI's ChatGPT, based on the robust GPT-3.5 architecture, is a game-changer in conversational AI. It emerged in November 2022, capturing global

attention with its human-like text generation capabilities, and has since become a pivotal innovation in chatbot technology. ChatGPT's ability to produce human-like text is achieved through advanced natural language processing (NLP) techniques and a substantial pre-trained model (Min B. et al., 2021). This innovation eliminates long-standing limitations of chatbots, making it possible to have coherent, context-aware conversations that span from simple inquiries to complex, domain-specific questions (Van Dis, E., Bollen, J., Zuidema, W., Van Rooij, R., & Bockting, C., 2023). One of ChatGPT's remarkable achievements is its ability to address a wide range of user inputs, even complex, open-ended queries, thanks to its deep learning approaches (Brown et al., 2020). This is a significant leap forward in chatbot technology, as it has been a historical challenge for chatbots to tackle complex, multifaceted questions. ChatGPT's versatility extends across numerous domains, including healthcare, finance, technology, and general knowledge, positioning it as a cornerstone in knowledge-based chatbot applications. Its influence on conversational AI is nothing short of transformative, redefining interactions with AI systems. ChatGPT paves the way for a future where chatbots play a vital role in customer support, virtual assistance, content generation, language translation, and beyond, ultimately reshaping the conversational AI experience. (Ray, 2023)

5. Chatbots in the Consumer Journey

Chatbots, a ubiquitous Human-Computer Interaction (HCI) tool, exhibit remarkable operational efficiency (Eren, 2021). Technological advancements have propelled their widespread adoption in customer service (Ho, 2021) and can have various roles in different stages of the customer journey (Copulsky, 2020; Quarteroni & Manandhar, 2009) such as:

Consumer Acquisition:

By offering customers pertinent information, personalized recommendations, and entertaining conversations, chatbots can assist in luring and acquiring new clients. Chatbots can generate leads by gathering contact information, screening potential clients, and setting up appointments. To give potential consumers product recommendations, cosmetic advice, and makeup tutorials,

for instance, the beauty retailer Sephora uses a chatbot on Facebook Messenger. Using the chatbot, in-store service bookings have climbed by 11%, and average expenditure has increased by 60%. (Chen et al., 2023)

Consumer Engagement:
Chatbots can help retain and delight existing customers by providing timely support, proactive notifications, and interactive content. Chatbots can also increase customer loyalty by offering rewards, discounts, and referrals. For instance, the pizza giant Domino's uses chatbots on several platforms so that consumers can place orders, check on the status of deliveries, and leave reviews (Jain, M., 2018). The chatbot has increased the customer satisfaction score by 4.6% and the repeat orders by 10% (Engati, 2021)

Consumer Retention:
With their ability to resolve problems, respond to inquiries, and provide answers, chatbots can lower customer attrition and boost retention. By sending out reminders, incentives, and personalized offers, chatbots can help keep customers from moving to other businesses. For instance, the online travel company SnapTravel employs a chatbot on Facebook Messenger and SMS to make reservations, answer questions, and provide hotel bargains. The income has increased by 40% and the retention rate by 20% thanks to the chatbot ('To Retain or To Acquire? The Survival Strategy in Post COVID-19', 2020).

Consumer Feedback:
By posing straightforward questions, carrying out surveys, and measuring sentiment, chatbots can assist in gathering and analyzing client feedback. Additionally, chatbots can use the input to enhance their functionality and level of customer support. For instance, the fashion company H&M utilizes a chatbot on Kik to inquire about the shopping habits, satisfaction levels, and style preferences of its clientele. The chatbot offers ratings, coupons, and customized clothing based on feedback (Shumanov, M. and Johnson, L., 2021).

Consumer Conversion:
By influencing customers, addressing concerns, and upselling or cross-selling goods and services, chatbots can boost income and sales. Additionally, by offering advice, rewards, and reminders, chatbots can decrease cart abandonment and enhance checkout completion rates. For instance, a chatbot on Facebook Messenger is used by florist 1-800-Flowers to assist clients in selecting, ordering, and sending flowers. It was observed that 70% of online orders placed by new clients have come from the chatbot (Kaczorowska-Spychalska, D., 2019).

Consumer Entertainment:
By offering engaging, imaginative, and dynamic material, chatbots can assist in amusing and entertaining clients (Cheng, Y., 2020). Through the incorporation of humor, personality, and emotion into their chats, chatbots can also increase customer happiness and delight (Ashfaq et al., 2020). For instance, Replika, a personal companion chatbot, uses AI to learn from users and provide engaging conversations based on their objectives, interests, and moods. More than 10 million people use chatbots, and they interact with them for 30 minutes a day on average (Hakim F. et al., 2019).

Consumer Interaction:
Chatbots can enhance consumer engagement and communication by offering responses that are conversational, human-like, and natural. Using social cues, empathy, and customization, chatbots can increase client trust and loyalty. For example, Woebot, a mental health chatbot, uses cognitive behavioral therapy techniques to provide assistance to end users to cope with stress, anxiety, and depression. The chatbot has been shown to reduce symptoms of depression by 22% in two weeks (Demirci et al., 2018)

6. Challenges Associated with Chatbots

The various challenges associated with the use of chatbots are as follows:

User Experience Challenges: There are various user experience issues with chatbot conversations. First off, there is a chance that chatbots will come out as robotic or impersonal because they frequently rely on prewritten scripts and

responses, leaving consumers disengaged or dissatisfied. Developers must give establishing pleasant and conversational communication a top priority to remedy this and make interactions more engaging. Another issue is that chatbots have difficulty accurately interpreting user moods and emotions from text inputs, which could result in misunderstandings or improper responses. It is necessary to increase emotional intelligence and sentiment analysis algorithms to improve user experience. Furthermore, chatbots may give irrelevant or off-topic responses, which can annoy users. Continuous training and model improvement are essential for eliminating off-topic responses because this problem frequently results from incorrect interpretation of user questions or a lack of contextual awareness. (Venkatesh et al., 2011).

Security and Privacy Challenges: There are many essential obstacles associated with the deployment of chatbots. The first is that chatbots could be vulnerable to security flaws, which could compromise critical user data and system vulnerabilities. To protect user information, strong security measures are required, such as encryption and frequent security assessments. Users' concerns about how chatbots use their data make data privacy another crucial issue. Strict adherence to data protection laws, open data processing procedures, and unambiguous privacy rules must be upheld to keep user trust. Furthermore, it is essential to recognize the ethical and legal issues raised by chatbot AI. Adherence to ethical principles and safeguards to minimize unintended consequences is necessary for addressing ethical challenges relating to data ethics, bias, and misuse (Schuetzler et al., 2020). The risk of chatbots being exploited to disseminate fake news and propaganda in the era of information warfare is also a concern, demanding the implementation of content verification mechanisms and monitoring for malicious activity. Additionally, organizations using AI chatbots must navigate complex legal landscapes, including compliance with data protection laws, liability for bot actions, and intellectual property issues associated with the chatbot's design and code. Data governance and compliance issues become paramount when handling sensitive data, necessitating adherence to protection laws like GDPR, HIPAA, and India’s Meity Regulations to avoid

legal consequences and ensure responsible data usage, ownership, and protection.

Ethical Challenges: To ensure ethical usage of chatbots, complete transparency in customer interactions is paramount. It is demonstrated that users perceive more skilled conversational agents (CAs) as being more socially present, emphasizing the importance of considering behavioral aspects in CA interactions (Schuetzler et al., 2020). Moreover, as home digital voice assistants, like Amazon Alexa, provide convenience by responding to voice commands for various tasks, they raise security concerns. It identified security flaws in Alexa, highlighting vulnerabilities stemming from weak one-factor authentication and the absence of physical presence requirements for access control, making them susceptible to attacks (Lei et al., 2019). Additionally, chatbots can encounter challenges related to human input, including misspellings, improper tone, mispronunciations, subtle humor, speech impediments, slang, and syntax errors. To maintain user engagement, adding personality to chatbots by giving them names and avatars can mitigate the risk of users disengaging from the conversation. While current technology may have limitations, ongoing technological advancements will likely address these chatbot weaknesses.

Technical Challenges: A chatbot's operation faces several significant difficulties. The development of scalable infrastructure, load balancing, and caching technologies is required for effective traffic management because excessive web traffic volumes might impair chatbot performance and cause response delays or failures. Natural language processing, machine learning, continuous training to improve accuracy and adaptability, and user feedback loops all play essential roles in designing an effective chatbot that can handle a variety of user queries and provide accurate responses. Adapting chatbots to various linguistic and cultural preferences requires considerable preparation and resources for businesses that operate across several geographies and languages (Abdellatif et al., 2020). Adopting robust analytics tools and processes is necessary to acquire insights and track key performance metrics. Effective monitoring and analytics are essential for evaluating chatbot

performance and user interactions. Last but not least, firms must set up feedback systems to collect user insights and apply this data for incremental improvements since collecting and acting on consumer feedback is an ongoing problem.

Business/Organizational Challenges: Integrating chatbots into existing business systems can be complex, as they must be compatible with a variety of platforms, databases, and communication channels, potentially leading to data silos and hindering their effectiveness. Furthermore, developing, deploying, and maintaining chatbots demands significant financial investments, including technology, training, and ongoing support, necessitating resource allocation to ensure a positive ROI (Thormundsson, 2022). Encouraging user adoption and effective utilization of chatbots, whether by customers or employees, is another challenge, necessitating proper training and change management strategies. Sustaining chatbot performance involves keeping responses up-to-date with accurate and relevant information, requiring content and knowledge management strategies and access to the latest knowledge sources (Hill et al., 2015). As chatbot usage expands, scalability becomes crucial, and accommodating increased user interactions without performance degradation may involve adding computational resources and optimizing algorithms.

7. Recommendations for Overcoming the Challenges Associated with Chatbots

To overcome various challenges, the following section highlights practical solutions to enhance user experiences, fortify security and privacy measures, address ethical and legal concerns, and tackle technical hurdles.

Overcoming User Experience Challenges:

To enhance user experiences, chatbot developers should focus on creating conversational and friendly dialogue, infusing natural language processing (NLP) to make interactions engaging. For instance, Duolingo's chatbot uses a warm tone to assist users in learning new languages, encouraging practice and providing supportive feedback (Jung, S.K., 2019). Developers can employ sentiment analysis and emotional intelligence algorithms, as seen in Replika,

an AI chatbot designed for mental health support, which uses sentiment analysis to detect user emotions and respond empathetically. Reducing off-topic responses, as demonstrated by Google's ChatGPT, can be achieved through continuous training and fine-tuning of machine learning models coupled with context-awareness features.

Overcoming Security and Privacy Challenges:

To address security concerns, implementing strong encryption, regular security audits, and intrusion detection systems, such as WhatsApp's end-to-end encryption, is crucial to protect chatbots from potential breaches. Data privacy can be ensured by adhering strictly to data protection regulations like GDPR and transparently communicating data handling practices to users, exemplified by Apple's Siri, which processes voice commands on-device to enhance data privacy (Ischen et al., 2020).

Overcoming Ethical and Legal Challenges:

Developers should follow ethical guidelines and prioritize fairness, transparency, and accountability in chatbots. They must actively address bias and unintended consequences, like IBM's AI Fairness 360 toolkit, which helps developers detect and mitigate bias in AI models, ensuring ethical AI deployment. Combating fake news and propaganda requires implementing content verification mechanisms and fact-checking, similar to Facebook's approach of using AI and human fact-checkers to identify and label fake news stories. Managing risks related to compliance, liability, and intellectual property involves clear legal agreements and expert guidance, as demonstrated by legal firms that use AI-powered chatbots to handle routine legal inquiries while ensuring compliance with legal and regulatory requirements (Grudin, J., & Jacques, R., 2019).

Overcoming Technical Challenges:

Effectively managing high web traffic can be achieved by employing scalable cloud infrastructure, load balancing, and caching mechanisms, such as Amazon Web Services (AWS) with its Auto Scaling feature. Designing an effective chatbot requires a combination of natural language processing,

machine learning, and continuous training, similar to Google's Duplex chatbot, which improved its understanding of user requests and became more effective through iterative training based on fundamental interactions. Localization and adaptation to different languages and cultures necessitate resource allocation, as seen in Slack, which provides chatbot support in multiple languages, tailoring its interface and responses to diverse linguistic preferences. Monitoring and analytics tools and processes help gather insights and track key performance indicators, exemplified by Google Analytics, which offers detailed analytics for chatbot interactions. Collecting and acting upon customer feedback is vital for continuous improvement, a practice followed by Slack to enhance its chatbot features based on user suggestions. (Barricelli et al., 2019)

7. Conclusion and Discussion

Chatbots, or conversational agents, mark a significant leap in AI development, enabling human-like interactions with digital devices across diverse sectors. They are a valuable subject of academic inquiry, bridging computer science, linguistics, psychology, and AI research. Insights into user interactions, machine learning, natural language processing, and the social and psychological implications of AI are among the many contributions made by chatbots. Moreover, chatbots are practical tools for educating students about AI and machine learning.

From a commercial standpoint, chatbots offer the potential to revolutionize operations, streamline tasks, reduce costs, and enhance efficiency. They find applications in various sectors, from sales and marketing to healthcare, offering personalized experiences based on user interactions. These versatile digital assistants facilitate not only customer support but also internal business processes.

The study of chatbots impacts a wide range of stakeholders, including businesses, developers, academics, and policymakers. Businesses gain from improved efficiency and superior customer experiences while developers and researchers advance AI capabilities. Academics and students find practical

tools for research and learning while policymakers grapple with the challenge of regulating this growing sphere. Chatbots present challenges, from user experience issues to ethical concerns. However, they represent a new era of data-driven, personalized customer interactions, optimizing resource allocation and improving the overall customer experience.

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CUSTOMERS' EXPERIENCES IN FINTECH

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Abstract:
Fintech is revolutionizing the traditional financial services industry by introducing ground-breaking and customer-focused solutions. The customer experience (CX) is now a key differentiator for fintech companies, as customers have more choices than ever before and attention spans are lower. As a positive CX can help increase customer loyalty, advocacy, and income for fintech companies, they are investing heavily in CX to act as a differentiator for attracting and retaining customers. In the early days of fintech, CX was often focused on only convenience. As fintech starts maturing, CX is becoming more focused on personalization and proactive customer support as they have to support omni-channel delivery mechanisms. Fintech companies face several challenges in delivering a positive CX due to complex products and services, trust issues, outdated regulation, multiple channels of delivery, high expectations from customers, intense competition, and cyber security issues. Despite these challenges, fintech companies are increasingly recognizing the importance of CX and are leveraging new technologies and methodologies for the same. This chapter focuses on the nuances of CX and how fintech companies are going up the learning curve.

Keywords: Customer experience (CX), fintech, omnichannel experiences, open platforms, embedded finance.

INTRODUCTION

Fintech (financial technology) denotes technology leveraged to improve and automate financial services, including banking, insurance, intermediation and other financial services. With the internet and cyber security technology at the backbone, fintech companies are focused on developing new, innovative and streamlined ways to deliver financial services to customers. Fintech companies are also complementing traditional financial institutions by offering structured products and services at optimum price points, making financial services more accessible and affordable for consumers.

Customer experience (CX) is an integral part of the system as the customer's hand-holding adds significant cost to the entire journey and is one of the major ways to differentiate products and services. Recognising it as a critical factor for success, fintech companies have started paying more attention.

As fintech employs platforms for the ease of transactions and customer experience, they leverage technologies that include applications of mobile platforms, cloud services, artificial intelligence (AI), big data, blockchain, machine learning (ML), cyber security, etc. These technologies are optimally utilised while developing new products and services and to support existing ones, such as:

a) **Web and mobile apps**: Fintech companies are deploying web and mobile apps that make it easier for customers to access and manage their finances. All prominent fintech companies and financial services providers now have web and mobile apps that are continuously updated.

b) **Peer-to-peer (P2P) lending platforms**: P2P lending platforms are used by individual entities to lend money directly to each other without having a bank as an intermediary. Major platforms in India include LenDenClub, Faircent, IndiaP2P, etc.

c) **Robo-advisors**: Fintech companies are developing robo-advisors that use pre-determined rules and systems to help customers identify their risk

awareness, invest their money and manage their asset allocation based on their risk profiling. Leading ones in India include Fisdom, Angel Broking, 5Paisa, Scripbox, Sharekhan, and ET Money.

d) **Crowdfunding platforms**: crowdfunding platforms allow businesses and individuals to raise money from several investors for investment and charity purposes. For example, Ketto, ImpactGuru, Milaap, and Kickstarter, to name a few in India, have been active aggregators.

e) **Payment processing platforms**: Fintech companies have built payment processing platforms that make it easier for businesses to accept customers' payments either domestically or from overseas. Paytm, CCAvenue, Billdesk, and Razorpay, lead the pack in payment gateways.

Fintech companies are also using technology to improve the efficiency of financial services and customer experiences. For example, fintech companies have started exploring AI and ML to help automate tasks such as fraud detection and risk assessment. AI and ML are also making it easier, faster and cheaper for financial institutions to service their customers.

Fintech companies are leveraging data and analytics to provide consumers with more personalized financial services. For example, robo-advisors can use AI to recommend investment portfolios that are individually tailored to each investor's needs and risk tolerance. Fintech companies are also using technology to reduce the cost of financial services. For example, P2P lending platforms can offer lower interest rates on loans than traditional money lenders. Overall, fintech is making financial services more convenient, accessible, personalized and affordable for consumers.

Fintech companies are helping consumers access financial services on their own terms and timelines. For example, consumers can now manage their finances using mobile apps and online platforms 24/7 without any human intermediation, something that wasn’t possible a few years back. This has also increased the customer’s expectations for faster turnaround times, and better experiences at touch points, whether physical or digital.

EVOLUTION OF CUSTOMER EXPERIENCE IN FINTECH

Customer experience (CX) has always been important in fintech, but it has become even more critical in recent years as the industry has become more competitive and customer expectations have risen. The customer experience (CX) is now a key differentiator for fintech companies, as customers have more choices than ever before and attention spans are lower. A positive CX can help increase customer loyalty, advocacy, and profits for fintech companies.

Customer today demands and expects the best because of the choices available. Fintech companies are now investing heavily in CX as they need to build scalable solutions. Fintech companies are evolving their offerings to ensure that the customer has the following:

- **Convenience**: Fintech companies prefer to develop convenient and user-friendly products and services. Customers can easily access their services, make payments, and manage their finances from anywhere, anytime.
- **Personalization**: Fintech companies are using data and analytics to personalize their offerings for each customer. This includes tailored recommendations, relevant rewards programs, and proactive customer support.
- **Transparency**: Fintech companies are more transparent about their fees, terms, and conditions than traditional financial institutions. This helps customers make informed decisions about their finances.
- **Security**: Fintech companies believe trust is paramount and invest in cyber security to protect their data and financial assets.

As fintech evolves CX has become more focused on personalisation. Fintech companies are now using usage patterns, data and analytics to understand individual customers' requirements and offer suitably tailored products and services. Fintech companies are also investing in proactive customer support. This means they are reaching out to customers proactively before they have a problem to offer help and support. Fintech companies are also focusing on

delivering an omnichannel CX to ensure that customers can get a consistent experience across all channels, whether they are interacting with the company online, mobile, or in person.

CHALLENGES OF ENSURING AN EXCELLENT CUSTOMER EXPERIENCE

Though both, the customer and fintech companies have evolved, products/ services have never been at the forefront before, and customer experience has suffered. Fintech companies face many challenges in delivering a positive customer experience (CX). These challenges include:

- **Complex products and services**: Fintech products and services can be complex and difficult to understand. This can make it challenging to deliver a CX that is both informative and engaging. The fintech landscape is complex and constantly evolving. This can be challenging for customers to keep up with, especially those who are not tech-savvy.

- **Trust**: Fintech companies are still relatively new and untested. This can make it difficult for customers to trust them with their money. Frauds are frequent and widely reported in media, making customers wary of trying a new product/ service or a company.

- **Regulation**: Fintech is a heavily regulated industry. Ensuring all rules are followed and adhered to adds costs and timelines to product/ service delivery. This can lead to delays and bureaucracy, which impacts customer experience.

- **Multiple channels**: Fintech customers interact with companies through multiple channels, including online, mobile, and in-person. This makes it challenging to deliver a consistent CX across all channels.

- **High expectations**: Fintech customers have high expectations for CX. They expect products and services to be easy to use, secure, and personalized.

- **Competition**: The fintech industry is highly competitive. This puts pressure on fintech companies to reduce costs, go to market faster (thereby

cutting corners by not testing products/ services thoroughly) and focus on short-term gains, which impacts CX significantly.

- **Security**: Fintech companies need to invest heavily in cyber security to protect customer data and financial assets. This can be a challenge, especially for smaller fintech companies.

In addition to these general challenges, fintech companies also face specific challenges in delivering a positive CX in key areas such as:

- **Onboarding**: Fintech companies need to make it easy for customers to open accounts and start using their products and services. However, the onboarding process can be complex and time-consuming, especially for customers who are new to fintech.
- **Customer support**: Fintech companies need to provide responsive and helpful customer support. However, it can be challenging to provide high-quality customer support at scale, especially for smaller fintech companies.
- **Dispute resolution**: Fintech companies need to build a fast and efficient process for handling customer issues. However, the dispute resolution process brings additional costs and can be complex and time-consuming. A bad customer experience is bad advertising.

Due to these challenges, fintech companies are increasingly recognizing the importance of CX. They are leveraging all the tools at their disposal, including AI and ML, to personalize customer interactions and provide proactive customer support. Fintech companies that can deliver a superior CX will be well-positioned to succeed in the competitive fintech industry.

3.1 How fintech companies can improve CX

Customer experience (CX) is essential for fintech companies to succeed in today's competitive market. Fintech companies can deliver a CX that exceeds customer expectations by focusing on customer needs, investing in technology, and creating a seamless customer journey. This leads to increased loyalty, advocacy, and revenue.

- **Focus on customer needs**: Fintech companies should focus on understanding the needs and pain points of their customers. Regular feedback loops are essential to improve products and services, as well as the overall CX.

- **Invest in technology**: Fintech companies can invest in technology to improve the CX. For example, they can use AI and machine learning to personalize recommendations and provide proactive customer support. They also need to invest in cyber security to protect their own and their customers' data and financial assets.

- **Create a seamless customer journey**: Fintech companies should strive to create a seamless customer journey across all channels. This includes making it easy for customers to switch between channels and get the support they need when they need it.

- **Be transparent and trustworthy**: Fintech companies should be transparent about their fees, terms, conditions and product parameters. Miss-sold products and services create the biggest pain points for customers, making it difficult to retain them.

- **Make it easy**: Fintech products and services should be easy to use and understand. This is especially important for customers who are not tech-savvy. Fintech companies can make the onboarding process easier and more efficient by using digital onboarding solutions. Fintech companies can also offer incentives to customers who complete the onboarding process quickly and easily.

- **Personalize the experience**: Fintech companies can use data and analytics to personalize their offerings for each customer. This includes tailored recommendations, relevant rewards programs, and proactive customer support.

- **Faster dispute resolution**: Fintech companies can improve the dispute resolution process by making it more transparent and efficient. Fintech companies can also provide customers with multiple ways to resolve disputes, such as through online portals, phone support, or arbitration.

Fintech companies need to invest heavily in infrastructure, processes and methodologies for the same. As in several cases, no prior processes existed, or are outdated, or are mired in outdated regulations, this task is not easy. Still, companies are working towards building up systems and processes and have leveraged technology to listen to customers to navigate this sensitive area.

EMERGING TRENDS IN CX

Fintech companies are investing in personalised, proactive, and omnichannel CX and ensuring their processes are backed up with leading technologies.

a) Role of Artificial Intelligence (AI) and Machine Learning (ML)
b) Open platforms
c) Customer-centric design

Role of AI and ML

AI/ ML are being deployed to improve CX in fintech and other industries as well by personalizing the customer experience, providing proactive customer support, and help detect and prevent fraud. AI-powered chatbots and ML-powered virtual assistants are now providing 24/7 customer support and answering customer questions, instead of call centres. AI and ML are being used to improve CX in fintech through:

a) **Personalized recommendations**: AI and ML help study customer data and behaviour for patterns which can then be used to build personalized recommendations for products and services. For example, a fintech company might use AI to recommend a new investment product to a customer based on their risk tolerance and investment goals.

b) **Proactive customer support**: AI/ML-powered chatbots and virtual assistants are now a common sight on websites and WhatsApp. These chatbots and virtual assistants can answer customer questions, resolve issues, and escalate complex issues to human agents.

c) **Fraud detection and prevention**: AI and ML can be used to develop sophisticated fraud detection and prevention systems. These systems can flag suspicious activities and accounts, helping to protect their systems and their customers from fraud.

In addition, AI and ML can also be used to improve CX in fintech by making products and services easier to use, providing more convenient and efficient ways for customers to interact with the company, automating repetitive tasks, freeing up human agents to focus on more complex customer issues and gaining a better understanding of customer needs and preferences.

The following fintech companies are leading in the use of AI and ML to build and improve CX:

Chime: Chime uses AI to personalize its banking services for each customer. For example, Chime uses AI to recommend new budgeting and spending tools to customers based on their financial data.

N26: N26 uses AI to power its fraud detection system. This system helps to protect N26 customers from fraudulent transactions.

Revolut: Revolut uses AI to provide customers with real-time spending insights. This helps customers to track their spending and identify areas where they can save money.

Klarna: Klarna uses AI to assess customer creditworthiness and approve loans in real time. This makes it easier for customers to get the financing they need when they need it.

Stripe: Stripe uses AI to detect and prevent fraudulent transactions. This helps to protect Stripe customers from fraud and keep their financial data safe.

As AI and ML technologies continue to develop, we can expect more companies to develop innovative and effective methods and processes to improve the customer experience in fintech.

Open platforms

Open platforms allow an industry cluster to share select financial data with other organisations who aggregate and make available the same for the benefit of collaborating companies. This helps in shared services' costs and

early anomaly detection. It also helps in building new and innovative products and services that meet the specific needs of customers. Deployment of the same in the financial industry has led to the development of new fintech products and services that are more personalized, convenient, and innovative. Open platforms play a significant role in improving CX in fintech by providing:

a) **Personalized financial advice**: Open banking allows fintech companies to access a customer's full financial picture, including their bank accounts, credit cards, loans and investments. This information helps in customer profiling which is then leveraged to provide customers with personalized and accurate financial advice.

b) **New and innovative products and services**: Open platforms are enabling fintech companies to develop products and services that were not possible earlier. For example, open platforms have led to the development of new payment solutions, budgeting apps, and investment platforms.

c) **More convenient and efficient ways to manage finances**: Open platforms allows customers to manage their finances more conveniently and efficiently. For example, customers can use open banking to switch bank accounts, consolidate loans, and track their spending across all of their financial accounts.

Overall, open platforms are having a positive impact on CX in fintech as it enables fintech companies to develop highly customised & convenient products and services for their target customers.

Following fintech companies are leveraging open platforms to improve CX, amongst others:

ETMoney: ETMoney works towards simplifying the financial journey of retail consumers, managing CX by leveraging design, technology and mobile platforms. Started as a direct MF investing app, it has spread its wings to offer more investment products.

Moneybox: Moneybox offers a variety of investment products. Moneybox uses open banking to make it easy for customers to invest their money. Customers can connect their bank account to Moneybox and set up regular investments. Moneybox then uses open banking to automatically transfer money from the customer's bank account to their Moneybox investment account.

Yolt: Yolt is a budgeting app that uses open banking to help customers track their spending and manage their finances. Yolt connects to a customer's bank accounts, loans and credit cards to understand their financial spending patterns. Yolt then uses this information to provide customers with insights into their spending habits and budgeting recommendations.

TrueLayer: TrueLayer is an open banking platform that provides fintech companies with access to customer financial data.

In addition to the benefits mentioned above, open platforms are also helping to make the financial services industry more competitive and customer-centric. By giving customers control over what part of their financial data is shared and making it easier for them to switch providers, open platforms empower customers and drive innovation in the fintech industry.

A. CUSTOMER-CENTRIC DESIGN

Customer experience (CX) is essential for fintech companies to build loyalty and advocacy and customer-centric design plays an important role in the same. Customers with a positive experience are likely to do more business with the company and recommend it in their close circles.

Fintech companies are increasingly adopting a customer-centric design approach. This means they are putting the customer at the centre of the product development process. This is helping to ensure that products and services are tailored specifically for ease of use and meet the customers' needs. Here are some ways that fintech companies can use customer-centric design to build loyalty and advocacy:

- Make it easy for customers to do business with you. Having a user-friendly website, mobile app, and efficient customer support channels.
- Personalize the customer experience by offering products and services that are individually tailored to customers' individual needs and preferences.
- Be transparent and honest with customers. Being clear about your fees and terms and conditions and being upfront about any potential risks.
- Resolve customer issues quickly and efficiently. When customers have a problem, they want it to be resolved quickly and efficiently. Fintech companies should have a process in place for resolving customer issues quickly and fairly.
- Reward loyal customers. Fintech companies can reward loyal customers with discounts, exclusive offers, and other perks. This can help to keep customers engaged and coming back for more.

FINTECH COMPANIES LEADING THE WAY IN CX

Here are some case studies of fintech companies that are leading the way in CX evolution:

a) **LenDenClub**: LenDenClub started operations in India in 2015 and has become India's largest alternate investment platform. Their P2P platform brings together investors looking for structured alternative investments and creditworthy borrowers looking to fulfil their monetary needs, especially those not covered by traditional credit-providing institutions.

b) **Chime**: Chime is a mobile-only bank that offers banking products and services, including checking and savings accounts, debit cards, and loans. Chime is known for its innovative and customer-centric approach to banking. For example, Chime offers features such as early paydays, overdraft protection, and fee-free ATM withdrawals. Chime also has a strong focus on customer support. Customers can contact Chime support 24/7 via chat, email, or phone.

c) **Revolut**: Revolut is a digital banking app that offers checking and savings accounts, debit cards, currency exchange, and investments, amongst others. Revolut is known for its easy-to-use interface and its wide range of features. Revolut also has a strong focus on customer support. Customers can contact Revolut support 24/7 via chat, email, or social media.

d) **Klarna**: Swedish fintech company that offers payment solutions, including buy now, pay later (BNPL), point-of-sale financing, and direct checkouts. Klarna is known for its flexible and customer-friendly payment options. Klarna offers a buyer protection program that protects customers against fraud and faulty items.

e) **Paytm**: Paytm is a payment processing platform that allows businesses to accept online and mobile payments. Paytm is known for its easy-to-use API and its wide range of features. Paytm also has a strong focus on customer support and offers a variety of support resources, including documentation, tutorials, and live chat support.

Fintech companies are always innovating to improve the customer experience and traditional financial services companies are trying to catch up with them. As a result, the customer experience in fintech is constantly evolving and improving.

CX FUTURE IN FINTECH

The future of customer experience in fintech is bright. Fintech companies are open to leveraging new technologies and systems to improve the customer experience, leading to business growth. Some of the key trends that are emerging and will be deployed by all companies sooner or later:

a) **Hyper-personalization**: Fintech companies will use robotics, artificial intelligence and machine learning to personalize the customer experience at scale. This will include tailoring products and services to each customer's needs and preferences, as well as providing personalized recommendations and support.

b) **Proactive customer support**: Fintech companies will use AI and machine learning to provide proactive customer support. This will involve identifying and addressing customer issues before they become problems.

c) **Omnichannel experiences**: Fintech companies will deliver seamless omnichannel experiences. This means that customers will be able to interact with fintech companies through their preferred channel, whether it is online, mobile, or in person.

d) **Embedded finance**: Fintech companies will embed financial services into other traditional products and services. This will cross-leverage the data using open platforms and make it more convenient for customers while simultaneously increasing business for the fintech companies.

e) **Financial inclusion**: Fintech companies will use technology to make financial services more affordable for everyone. This will help promote financial inclusion and reduce differential access to financial services.

These trends will lead to a more personalised, convenient, and inclusive customer experience in fintech. Fintech companies can further continue to improve the customer experience by:

a) Listening to customers and understanding their needs. Fintech companies need to collect feedback from their customers and use it to improve their products and services. This feedback can be collected through surveys, customer reviews, social media, and other channels. Social networks provide a useful source for feedback and fintech companies have leveraged teams to ensure that the feedback is responded to and incorporated in their systems.

b) Investing in technology. While new-age fintech companies invest in new technologies to improve the customer experience, traditional finance companies have lagged behind.

c) Creating a seamless customer journey. Fintech companies need to create a seamless customer journey across all channels. This means

making it easy for customers to switch between channels and get the support they need when they need it.

d) Making products and services easy to use and understand. Fintech products and services can be complex, so fintech companies need to make them easy to use and understand. Fintech companies can do this by providing clear documentation, tutorials, and support resources.

e) Focusing on security and privacy. Fintech companies need to invest heavily in security and privacy to protect customer data and financial assets. This includes using the latest security technologies and implementing robust privacy policies.

By focusing on these areas, fintech companies can deliver a superior customer experience that will help them to attract and retain customers and succeed in the hyper-competitive fintech industry.

CONCLUSION

Customer experience (CX) has evolved significantly in the fintech industry, becoming a critical factor for success. Early fintech companies focused on convenience & price and have started prioritizing personalization now along with proactive support for omnichannel experiences. Fintech companies leverage data and analytics to tailor offerings to individual customers, providing relevant recommendations, rewards programs, and proactive customer support. They also strive for transparency in fees, terms and conditions, to foster customer trust.

However, challenges remain in delivering an exceptional CX in fintech: complex products, trust issues, regulations, multiple channels, high expectations, competition, and security concerns pose obstacles. Fintech companies must address these challenges to gain a competitive edge. To improve CX, fintech companies should focus on understanding customer needs, investing in technology, and providing personalised, proactive, and transparent experiences across all channels. By prioritising CX, fintech

companies can attract and retain customers, drive loyalty, and achieve long-term success.

Fintech companies are using artificial intelligence (AI), machine learning (ML), and open platforms to improve customer experience (CX). They are also adopting a customer-centric design approach. Fintech companies are using technology and customer-centric design to improve CX and build loyalty. However, traditional companies have yet to catch up and become tech-savvy.

The future of customer experience in fintech is bright, with a focus on hyper-personalization, proactive customer support, omnichannel experiences, embedded finance, and financial inclusion. Fintech companies can continue to improve the customer experience by listening to customers, investing in technology, creating a seamless customer journey, making products and services easy to use and understand, and focusing on security and privacy.

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With a passion for academics and a personal mission to help people achieve their best, Dr Balwani brings with him thirty years of academic, investment research and management experience across academic institutions, leading brokerages, and financial research establishments. Currently leading the SBM, NMIMS, Navi Mumbai campus, Dr Balwani previously held leadership positions in Doon Business School as Campus Director, as Dean in IFIM Business School, as Head of Research in a leading KPO, and as Managing Director of a prominent Investment Research Company. He switched to academics to share the insights gained from his financial sector experience, which has been very well received. He has developed new courses and his current research interests focus on behavioral finance and fractal analytics in finance. A prolific writer, Dr Balwani has authored numerous research reports, study guides, cases, research papers, and articles, apart from two books, one on "Accounting and Finance for Managers" and the other on "Business Policy and Strategic Management". Dr Balwani has a PhD in Strategy and an MBA in finance from Devi Ahilya University, Indore, and a BSc (Electronics) from Hindu College, Delhi University. It is his mission to make learning fun and experiential so that knowledge absorption is natural while exploring the intricacies of the subject matter. Dr Nitin Balwani can be contacted at: nitin.balwani@nmims.edu

INTERNAL STAKEHOLDERS: DIGITAL TRANSFORMATION FOR COMPETITIVE ADVANTAGE

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Abstract:
Over the last 3 decades, technological advancements in businesses and workplaces have made a profound impact on all the stakeholders, leading to changes in work culture, working habits, employee and team interactions, and skills requirements. Information and Communication Technology or ICT, has been the prime driver of the growth of business and industry by facilitating faster decision making and a much wider spread of businesses. Besides, it has led to many new business opportunities and new business models have developed viz. e-commerce, BPO (Business Process Outsourcing), KPO, Mobile-based cab hailing, Hyper-local deliveries etc. which are today recognised as new industries. In this chapter, we look at these changes and their effect on internal stakeholders of the business. For understanding, the term Internal stakeholders has been defined as all those who are part of the Value chain and are involved in creating value for the end consumer as part of the Organisation. Thus, it includes all the employees, Management and Directors of an Organisation as well as its suppliers and vendors.

Keywords: Digitalisation, digital employee experience (DEX), business transformation, digital technology, supplier transformation.

Prologue

Umesh Kumar, A Senior Vice president and an industry veteran in the Paints Industry, was sitting in his office and reminiscing. 35 years back he had joined as Branch Manager of the Indore branch of a leading Paints Company. For any formal communication to his Head office, he would dictate the letter to a secretary who would then type it out on her manual typewriter with multiple carbon copies and send the Inter-office memo by courier. For urgent matters, she would book a trunk call with a local phone exchange and after an indefinite wait, he would be able to talk to the desired person for about 3 minutes. He was so happy and felt so empowered on the day when, with the approval of the CEO & CFO, he got an STD (Subscribers' Trunk Dialling) facility installed in his office phone and he could dial long-distance calls anytime he needed to.

One of the main responsibilities of Umesh was demand forecasting of sales 3 months in advance. The plant would manufacture the desired shades and distribute them to all depots in forecasted quantities after 2 months so that they would be available in time for distributors' sales. Umesh used to do this exercise manually using large sheets of paper, which would be then sent to the factory. At that time, he wished there was some way to do this cumbersome exercise automatically. And now, with the help of XL sheets and ERP-based computer applications, everyone in H.O. and factory knows what the demand would be, as they have a complete analysis of sales data on a real-time basis.

Umesh realised that the all-pervasive technology has completely changed the way business is conducted today. More importantly, how all the workers have adapted to the changing business environment by upskilling themselves on technology. The secretaries of erstwhile have been replaced by an entire generation of female Managers and Leaders who are equally empowered, skilled, and knowledgeable.

1. Introduction

The evolution of technology, especially in the last 30 years, has changed the way business is conducted. Any technological innovation earlier was need-based and followed the adage – Necessity is the mother of Invention. However, the speed of technology change has far outpaced the adoption as well as the need. As Business Organisations embrace digital technologies to

stay ahead in a highly competitive environment, the effect of this transformation extends beyond just their products and services. The stakeholders of the Business – both – internal as well as external – play a crucial role in leveraging the technology to achieve the desired business goals. The digital transformation has thus become a pivotal force that is driving change across the industries. This chapter explores the impact of digital transformation on the Internal stakeholders of the business. For this discourse, the internal stakeholder is defined as all those individuals and business entities who are involved in creating value for the end customer, viz. employees, suppliers, and vendors. It examines their experiences, challenges, and opportunities in the digital transformation. This helps us to understand how they were compared to upskill themselves, redefine their roles, collaborate and innovate in the value chain ecosystem. By understanding these dynamics, Organisations can better navigate the path of successful digital transformation.

2. Evolution of digital technology

Until the early 80's, all technological development was focused on the Manufacturing industry. The innovations helped improve the efficiency and productivity of plants and machinery. This affected the working of a very few employees who were required to upskill themselves. The computer systems also required specially trained operators and were used for specific business applications only. They were also regarded as part of business machinery only. As a result, most of the workforce especially the office workers did not see any change in their way of working, as their work remained unchanged over the year. A newly joined employee was expected to perform the same tasks in the same way as a highly experienced one. Therefore, experience was considered more important and given more weightage over knowledge.

The advent of personal computers in the mid-80s resulted in a change in thinking in the way the world perceived computers. It was shortly followed by the launch of commercial Internet in the late 80's. Together, both opened a plethora of opportunities for business and private applications and hence were popularly known as ICT (Information and Communication Technology).

ICT has provided two major advantages in all spheres of life - (a) easy access to information gathering and processing, and (b) easy communication anywhere, anytime in any form.

This has transformed not only the way business is conducted, but also affected the personal lives of people at large.

3. The effect on employee

As is evident above, the digital transformation of businesses has taken place in the last 3 decades after 1990. The people who joined the workforce in the 80s or early 90s have been able to witness the transformation from the traditional way of business to the digital business systems and processes.

i. Effect of digital technology

Digital transformation of businesses has always been a critical imperative for improved performance and growth of the business. The effect on employees due to digital transformation has been the subject of several studies which have termed it as Digital Employee Experience (DEX). The success of the adoption of technology and its adequate utilisation depends on a positive DEX. (Daud, S.R. et.al, 2021)

Digital technology has been the main driver of business growth. It has enabled faster decision-making with access to more accurate data and analysis. This has given rise to an important and successful Management value - "Management by fact"(Pfeffer, J., Sutton, R.I., 2006). Management by Fact depends on collected information which is processed using customised applications and presented for informed decision-making. It is sharply in contrast to Management by gut or experience – which was hitherto, of immense value and universally practised.

ii. The role of technology in communication and collaboration

The availability of a plethora of communication tools has facilitated all modes of communication viz. verbal, written, graphical, video etc. irrespective of the distance, time, or place. This has eliminated the efforts required earlier for

discussions such as travel for meetings etc. – a phenomenon that has come to be known as the "Death of Distance." (Nijkamp P., 2017) As a result, meetings have become more frequent and common, leading to well-deliberated and improved decision-making.

iii. Challenges and opportunities for employees

The technological advancement presented some very unforeseen challenges for the workforce, Managers and even the Top Management. As desktops started replacing secretaries, the Managers had to upskill themselves with computer programs. This was also driven by the need for confidentiality and faster communication. Besides with the evolution of technology, they were required to first learn the computer languages of the Third and Fourth generations like WordStar, WordPerfect, D-Base, Lotus 1-2-3, etc, and then re-learn the fifth and sixth generation languages like MS Office etc. The Organisations usually hierarchically deployed the technology – the latest technology devices were given to higher ranks first. As a natural fallout, for example, owning a laptop first in the office became a status symbol.

The Organisations started preferring the recruits, who had studied the latest technology in professional institutes and were more productive than the older employees who had to be trained in it. In this process, the weightage given to experience was diminished, and knowledge gained an upper hand. To stay relevant and employable, the older employees are required to compete with and stay ahead of the new generation of knowledge workers. In the current environment things like refresher training, upskilling, and reskilling have become commonplace and both, the employees as well as the Organisations, place significant importance on them as a normal way of career advancement.

Technological advancements also gave rise to several new business opportunities. Several technology-intensive processes were strategically outsourced by the Companies. This gave rise to a whole new industry called BPOs (Business Process Outsourcing) which handled specific business processes such as call centres, medical transcriptions, Documentation Management etc. Besides, outsourcing opportunity was also created in the form of KPOs (Knowledge processes Outsourcing), where specialist business

entities which were subject matter expert in a particular field, handle knowledge-based processes such as Legal, Technical, R&D, Medical and Healthcare processes and the businesses prefer to outsource such tasks to subject matter experts. Employees with relevant experience in the Companies found an opportunity to start their businesses in such areas.

iv. Adaptation to enhanced teamwork

The ease of communication due to technological advancement caused enhanced collaboration of employees for every task and project leading to increased teamwork. Sometimes, people saw it as a loss of their individuality and were not able to perform to their best ability. At other times, people saw it as an opportunity to dominate the team, leading to the rise of team conflict. With the help of ERP (Enterprise Resource Planning) systems (Enterprise Resource Planning systems) Teamwork has permeated the culture of the Organisations, and employees had to learn to share responsibilities, knowledge, and work as well as failures and successes. Working and sharing in teams has been the most challenging aspect of adaptation for all and continues to be so. While it may result in a loss of productivity temporarily, Organisations have experienced enhanced results and better outcomes on a long-term basis. Studies have shown that the Digital Employee experience has influenced the effectiveness and performance of the Company. (Syahchari, D.H. et al., 2021).

v. Effect of globalisation on employees

As the Organisations have expanded overseas, the teams also have become multi-national and multi-cultural, where people have adapted to work with diverse cultures, across different time zones. Globalisation has made employees more flexible and adaptable to diverse cultures, approaches and working styles. The Companies also value and prefer to hire a Global Manager who has experience working in global teams.

Intel Corporation, based in Santa Clara USA, designs, manufactures, and sells computing and related products worldwide. Its revenue topped USD 63 Billion in 2022* and it has offices in every part of the world. A routine day for

a manager based in India starts with a conference call at 7.30 am, with his colleagues in Singapore, and ends with another call at 9.00 pm with his colleagues in the US.
Most of the multi-national companies are accustomed to this way of working.

*Source: https://www.globaldata.com/company-profile/intel-corp/

vi. Effect on personal time

The work was supposed to be done in offices and employees were accustomed to having personal time once they left the office in the evening. This was an accepted norm before the ICT technology and even till after the use of desktops. However, all this changed with Mobile phones and laptops, and the distinction between work time and personal- time disappeared. The employees started carrying work to home and doing office work at home till late evenings and on weekends and holidays, often unwillingly and to the chagrin of the family. Thus, it has been seen that the digital transformation had a positive acceptance by employees at a professional level but it had a negative effect on a personal level and has been resisted. (Van Der Schaft, A.H.T., 2022)

With the help of digital technology, employees can work at any time and from anywhere, whether it is at home, restaurants, airport lounges etc. This has reduced the need for a formal office space. Several new Companies have preferred not to have an office at all. Their employees work from home and meet in Cafes or food courts of Malls.

Several Companies are providing serviced offices, also known as co-working space. These have come up in popular business hubs and near airports of all major cities of the world. They provide ready-to-move-in offices with all basic infrastructure like broadband internet, secretarial services, tea & coffee dispensers etc. and offer complete "plug and play" services. One can walk in and use an office for a few hours, or few days or even a few months depending on the requirement. Some well-known companies are WeWork, Regus, Awfis etc.

This has been a boon for travelling Managers of large Corporations, who after reaching a new town, need an office space just for some meetings for a few hours. They are also quite popular with start-ups as well as Companies that are expanding and need immediate office space. A Company may take small office space for a few months till its business is established and it gets its place for the long term. Several other Competitors have joined Regus in offering such services and Co-officing has become popular among Businesses.

Source: https://www.mordorintelligence.com/industry-reports/india-coworking-office-spaces-market

During the period of lockdown due to the pandemic, the technology proved to be a saviour and helped the businesses to continue functioning with the help of remote working from homes. A lot of employees, especially in the IT (Information Technology) sector, while working from home were able to do multiple jobs for different Companies. This came to be known as Moonlighting. While this provides an opportunity for employees to work for more than one company at a time and thus earn more, the jury is still out on the ethicality and the risks associated with moonlighting.

4. Effect on the vendors, suppliers and business partners

The twin advantages of ICT i.e., easy access to information and faster communication have changed the way Companies deal with their business partners. The increase in competition has forced the Companies to reach the customers first. Besides, it has also put pressure on their margins, so the Companies also need to reduce their costs. ICT has played a leading role in helping the Companies in achieving both objectives.

i. Supply chain visibility and efficiency

The digitization of supply chains has a profound impact on suppliers. Through technologies like IoT (Internet of Things), RFID (Radio Frequency Identification), and blockchain, businesses have gained unprecedented visibility into every stage of the supply chain. This not only enhances efficiency but also provides suppliers with valuable insights, enabling them to optimize their operations, reduce costs, and improve overall performance. Not

just the suppliers, but the LSPs (Logistics Service Providers) have also been forced to adopt digitalisation to provide complete tracking of customers' shipments while in transit, as well as ensure efficiency in their Logistics network. Digital Transformation has helped in addressing main challenges, such as the complexity of the Logistic network and lack of adequate resources, faced by a Logistics Service Provider (Cichosz, M. et al, 2020)

ii. Data-driven decision making

Digital transformation has enabled easy access to a wealth of data for all businesses. For suppliers and business partners, this means more accurate demand forecasting, inventory management, and production planning. The ability to make data-driven decisions fosters a more strategic and proactive approach to meeting the needs of both suppliers and organizations. While on the one hand Digital Technology has helped in improved performances for businesses, its adoption has posed several challenges such as choosing the right technology which will benefit Organisational performance, and the capability of the Organisation to adapt and adopt a new way of working. In most of the cases, the digital transformation has brought about a change in business processes. Sometimes these changes have resulted in performance failures, if not handled properly. Organisations need to be selective in choosing the right technology and must have a clear technology adoption roadmap identified before embarking on this transformation. (Gezgin et. al, 2017).

Dabur India Ltd. is a Delhi-based FMCG (Fast Moving Consumer Goods) leader with a product portfolio of over 600 SKUs (Stock Keeping Units) in Ayurvedic medicines, foods, grooming and health supplements. It clocked a turnover of INR 11,529 Cr during FY '23. To reach its customers, it has a complex, multi-layered and multi-channel distribution network with over 2.5 million retail outlets. Dabur has invested in an ERP system to connect its Distributors under a program called Drishti – A front-end ERP program that provides updated information on distributors' sales and stocks to the central warehouse. It has further invested in connecting its key retailers to the ERP network as well. As a result, the sales and balance stock from all sales points is updated on a real-time basis which helps to ensure accurate demand

forecasting, timely product availability with minimal stock-outs, and at the same time minimal obsolescence through unsold old stocks.

Source: https://bsmedia.business-standard.com/_media/bs/data/market-reports/equity-brokertips/2021-10/16336737850.97949400.pdf

iii. Enhanced collaboration and communication

Digital transformation has brought about seamless communication and collaboration between companies and their suppliers or business partners. Digital transformation along with trust and joint problem-solving has proven to be highly valuable to establish supply chain resilience. (Murtaza Faruquee et.al, 2021) Cloud-based platforms, real-time data sharing, and collaborative tools enable instant communication, reducing the delays associated with traditional methods. This enhanced connectivity allows for quicker decision-making and more agile responses to market changes.

iv. Shift in expectations and skill sets:

As organizations become more digitally mature, they expect their suppliers and business partners to keep pace. There is a growing demand for digital capabilities, innovation, and adaptability. Suppliers need to invest in their digital transformation to meet the evolving expectations of their clients and remain competitive in the market.

v. Strategic Partnerships and ecosystems

Digital transformation encourages the formation of strategic partnerships and ecosystems. Organizations are no longer isolated entities but participants in a larger network of interconnected businesses. This collaborative approach fosters innovation, accelerates time-to-market, and creates a more resilient business environment.

Shoppers' Stop is regarded as a pioneer and market leader in Organised retail, achieving a turnover of little over 4000 Crores in FY '23. It has a chain of 157 retail outlets offering a wide range of dresses and dressing accessories. Previously, the stock replenishment was done from centralised warehouses, based on demand from outlets. This would take about 5-7 days, resulting in

frequent stockouts at outlets.
Shoppers' Stop implemented a seamless ERP with its suppliers, which helped suppliers monitor sales and stock levels at each retail store of Shoppers' Stop on a real-time basis, and effect Direct Store Delivery to all retail stores within 24-48 hours. This has ensured proper stock keeping at all outlets and minimised stock-outs.

Source: https://www.supplychaintribe.com/index.php/article/all-for-one

vi. Transformation of business models

The digitization of business models often leads to a shift in the way products and services are delivered. Suppliers may find themselves needing to adapt to new methods of distribution or production. Business partners must also align their strategies with the changing landscape, ensuring that their offerings remain relevant and competitive in the digital era.

Medium and small-scale manufacturing Companies which form the backbone of the economy as suppliers to large manufacturers, are also quick to adapt to modern technology. E-tendering has helped them participate in tender and win orders from any part of the country, thus expanding their business reach manifold.

Many new businesses, especially in the service industry have come up because of advancements in technology. The E-Commerce industry is one such example which can take orders online using a web platform and deliver directly to the homes of customers. As an extension to e-commerce is the Hyperlocal delivery Companies, which are delivering items of daily necessity within 30 minutes or less, based on mobile app-based orders. With the help of digital technology, the battle for customer ownership has moved from retail counters to the customers' doorsteps now. Further evolution of mobile commerce and quick commerce are testimonies of how digital transformation is leveraged to improve products, services, and information in the market. In the latest age of digital marketing, consumers have continued to utilize revolutionary technologies and smart apps to learn quickly about the relative benefits and demerits of the goods and services they wish to purchase.

Companies too are experiencing digital transitions to consider the purchasing habits of customers and to build models that take advantage of strategic differentiation. (Rammohan S. et.al, 2020)

5. Conclusion

The digital transformation has a profound and irreversible impact on both the employees and business partners alike. It has changed the basic culture of the Organisations and the way they conduct their business. The employees are adapting fast to the latest technology and have now come to realise that the evolution of technology is not a one-time process but a perpetually continuing one. This has given rise to dogma – In Industry, Change is the only constant factor.

The suppliers and service providers have used technology to meet the expectations of their large OEM buyers. The technology adaptation has helped in upgrading them to Partners in the business growth of the OEMs and principal Companies. This has helped in serving the customer in a better way, as well as to reduce the cost thus improving profitability for both.

While the benefits of digital transformation are immense, it also introduces new challenges, particularly in the realm of cybersecurity. With increased connectivity, the risk of cyber threats becomes more prominent. Businesses must collaborate with their suppliers and partners to implement robust cybersecurity measures, ensuring the protection of sensitive data and maintaining trust in their digital relationships.

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THE EFFECTS OF STUDENTS UTILISING CHATGPT ALONG THEIR EDUCATIONAL JOURNEY

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Abstract:
ChatGPT, an artificial intelligence (AI) tool, is altering the higher education environment, offering new avenues for teaching and learning. However, this change poses unforeseen ethical complications. To ensure that technology and ethics coexist, the authors explore the complicated ethical context of ChatGPT in higher education. This chapter examines a few significant aspects of the implications of using ChatGPT in higher education. The institutional policy framework's function in guiding this transition is also crucial. The chapter also discusses how the inclusion of ChatGPT may affect academic integrity and ethical issues.

Keywords: ChatGPT, ethical considerations, higher education, academic integrity, student perceptions, educator perspectives, learning process, AI integration, ethical guidelines

1. Introduction

Alan Turing created a test in 1950 to see if a computer could accurately replicate human intelligence. According to the "Turing Test," computers may be deemed "intelligent" if they can converse with a human indistinguishable from that of two humans. No AI system has passed the Turing Test. However, some have come close (Whalen & Mouza 2023). With the introduction of ChatGPT, sophisticated AI-enabled chatbots and the dimensions of teaching, learning, and evaluation may be gradually disturbed (Zhai, 2023). ChatGPT-4 has passed graduate-level tests in several fields, including business, law, and medicine. A partial IQ exam revealed that ChatGPT had a Verbal IQ of 155, putting it in the top 0.1% of test takers. (Roivainen, 2023). The New York City Department of Education and other prominent universities, like Cambridge and Oxford, have banned ChatGPT in response to these remarkable outcomes. ChatGPT' s remarkable human-like qualities have outperformed the majority of modern technology that we have encountered in the past (Drumm et al, 2023).

A growing urgency has grown around issues of academic integrity, student autonomy, and the nature of pedagogical practices as universities and colleges embrace ChatGPT as a flexible instrument for learning support (Mhlanga, 2023). As we can infer, the digital environment is continually altering how we may obtain knowledge and learn. (Stahl, 2022). To maintain the standards and integrity of higher education, educators, students, and institutions must understand the implications of the use of artificial intelligence by their students (Currie, 2023). In evaluating students seeking AI-driven support for their learning and academic projects, bias and equity issues must be addressed (Ray, 2023). The moral quandaries are multifaceted; these include concerns such as preserving academic integrity, utilising AI assistance ethically, and addressing issues of bias, equity, and implications for the responsibilities of educators. Furthermore, the dynamic interaction of technology and education demands a thorough examination of the moral precepts that should guide its integration (Rasul, 2023).

This chapter analyses the many challenges arising from the increased use of ChatGPT in higher education settings. The study aims to show how to go towards an academically engaging and morally upright future where ChatGPT complies with the strict standards of higher education by critically analysing these ethical components.

2. Role of Technology and Artificial Intelligence in Education

The emergence of Artificial Intelligence (AI) in education represents a transformative paradigm shift in the way we teach and learn. Natural language processing and machine learning algorithms are two examples of artificial intelligence (AI) technologies that have become more and more popular in educational settings due to their potential to improve learning (Fuchs, 2023). AI-powered solutions provide an innovative approach to education by allowing personalised learning routes that dynamically adjust to meet the demands of individual students. Moreover, they simplify administrative duties such as grading, freeing up teachers to concentrate on mentoring and providing quality instruction. Furthermore, incorporating chatbots with sophisticated AI features, like ChatGPT, improves the educational process by giving students immediate assistance with tasks and fast answers to questions (Chen, 2020). AI is also useful for data-driven decision-making; it can analyse big datasets to identify trends, improve curriculum design, and predict student outcomes (Ahmad, 2022). Artificial intelligence (AI) has numerous new uses in education, particularly with modern educational innovations like gamification, digitisation of course materials, and individualised instruction (Loeckx, 2016). AI's position in education will grow as technology develops, influencing teaching and learning in ways that necessitate carefully weighing its possible advantages and moral implications.

Mostly, people are excited about using social media in educational settings, and public discussion on the platform is mainly positive (Tlili et al, 2023). Likewise, Cotton et al. (2023) discovered some advantages of using ChatGPT in addition to its disadvantages. A select few others commended ChatGPT's writing for being "coherent, (partially) accurate, informative, and systematic"

and proposed developing educational activities that incorporate artificial intelligence (AI) to encourage students to think like real-world problem solvers (Warschauer et al, 2023). Concerns among educators that artificial intelligence (AI) tools will mislead students by providing erroneous information sparked proposals to ban or outlaw their usage in the classroom (İpek, 2023). Conversely, proponents of ChatGPT argue that it provides an opportunity to teach students how to engage with AI critically and creatively and utilise it ethically and responsibly (Hostetter, 2023).

3. The Capabilities of ChatGPT in the Academic Ecosystem

ChatGPT allows users to communicate textually with it and responds to their queries and inputs reasonably and suitably for the given context. An extensive corpus of online textual information has served as the pre-training corpus for the AI-powered chatbotChatGPT. Its goal is to understand text messages and generate human-like text responses in conversations (Rospigliosi, 2023). Both Chat GPT and Google Bard can generate human-like responses to statements, open-ended queries, and requests for academic content (Motlagh, 2023; Ahmed, 2023). ChatGPT preserves the flow of a conversation and the discussion's context. It keeps track of earlier messages and deftly combines them with fresh responses to produce coherent and logical dialogues.Furthermore, its language translation abilities facilitate communication and cross-linguistic learning (Mhlanga, 2023).

ChatGPT performs exceptionally well as a learning aid in the educational field, providing in-depth explanations, breaking down complex concepts, and providing extra study materials. Computer science students working on coding and programming tasks assume the role of a dependable companion by providing code snippets, debugging advice, and explanations of complex coding aspects. It exhibits efficacy across various uses, including chatbots that expeditiously address customer inquiries and manage tasks such as reminding users, answering trivia questions, and providing guidance. It also has a conversational entertainment feature, which amuses users with jokes, stories, and cheerful talk during low periods of the user (Ali et al, 2023).

Notably, even though ChatGPT demonstrates impressive linguistic abilities, it has limitations. One of these drawbacks is that it can yield prejudiced or erroneous data. The quantity, diversity, and complexity of the training data significantly impact the correctness of the system, in addition to the calibre of the input data provided by the students (Baidoo & Ansah, 2023). The algorithm may not fully comprehend the nuances and subtleties of human language, which can lead to incorrect responses. Errors may also result from the quality and diversity of the training data used to build the NLP model (Hadi et al, 2023; Dhanvijay et al, 2023; Fuchs, 2023). Because ChatGPT was trained "on English-language texts, with the cultural biases and values embedded in them, and then aligned with the values of a fairly small group of US-based contractors," it has earned the moniker "multilingual but monocultural." (Bang et al, 2023). Students who rely too much on resources like Chat GPT and Google Bard risk become passive learners and may readily accept the answers provided by the system without questioning or critically evaluating errors that may be part of the results (Sok & Heng, 2023; Baidoo & Ansah, 2023).

4. Academic Integrity and Plagiarism

The principle of academic integrity guides the ethical compass of higher education, but AI tools like ChatGPT have thrown a new set of challenges into the mix (Currie, 2023). An ethical concern that looms large is students' potential misuse of ChatGPT to generate academic content, such as essays or assignments, without proper attribution or originality. That raises fundamental concerns about the validity and originality of academic work in the digital age. As technology evolves, so do the means of academic dishonesty, and educators must grapple with this ever-present ethical dilemma (ÇERASİ & BALCIOĞLU, 2023). When incorporating ChatGPT into higher education, the questions of academic integrity and plagiarism are crucial. Whether these AI tools are prohibited or accepted, the students' submissions still need an improved rules of evaluation (Neumann et al, 2023).

ChatGPT in academic research can define study themes, generate novel ideas, and summarise large texts to uncover significant discoveries Rahman et al.

(2023). However, they did point out certain disadvantages of using ChatGPT for academic writing, such as the potential for incorrect research gaps, questions, and problems. Furthermore, because ChatGPT does not have access to datasets, it cannot do statistical analysis (Rahman, 2023). Tlili et al (2023) discourse regarding using ChatGPT in higher education environments is predominantly positive and fervent. The continuation of discrimination, a lack of context, and possible problems with academic integrity are a few of the problems that could endanger education (Limna et al, 2023). Finding a way to support academic integrity while utilising technology to aid learning is a persistent ethical challenge in the age of artificial intelligence in higher education (Rudolph et al, 2023). Without this, the core values of academia—honesty, intellectual rigour, and source citation—are in danger. Students undermining the value of research and critical thinking skills, passing off texts generated by ChatGPT as original work, and undermining trust within the academic community all jeopardise the learning process (Jarrah et al, 2023).

5. Other Pedagogical Concerns

Online learning platforms, video lessons, and e-books are just a few learning materials made more accessible by technology. It liberates students from time and location limits, allowing them to improve their knowledge and abilities independently. However, there are concerns that technology will lead to decreased social connection between students and teachers. Personalised instruction is another intriguing aspect. ChatGPT offers tools and personalised explanations to help tailor learning experiences to each student's needs. However, unforeseen consequences of personalisation may undercut the purpose of a well-rounded education by limiting exposure to competing perspectives. (Opara et al, 2023). Although ChatGPT provides a wealth of information and resources that improve students' understanding of various courses. There is a caveat to this benefit: if students rely too heavily on ChatGPT, they may lose the ability to think critically or independently, resulting in surface-level learning rather than in-depth comprehension. (Fomichov & Fomichova, 1994). It can also lead to unequal access to AI tools and technology, exacerbating educational gaps and disadvantaging some students (Rasul et al, 2023). Furthermore, students may find it easier to

understand complex subjects thanks to ChatGPT's assistance, but more is needed on AI explanations to improve interactions between students and teachers (Firat, 2023).

Education is not only about memorising facts; it is a dynamic process that develops crucial cognitive abilities and encourages independent thought. An over-reliance on AI could jeopardise these core components of education and raise moral questions about technology use in the classroom (Iskender, 2023). ChatGPT can produce ideas and text but cannot stimulate creativity as much as face-to-face communication. Forcing students to rely solely on AI for creative tasks such as essay writing or content creation may hinder their creativity and originality. (Grassini, 2023). Students' ability to engage in meaningful social relationships with peers and professors may be compromised if they deal mainly with AI. (Birenbaum, 2023). ChatGPT could offer prompt and practical solutions but might not promote in-depth study or thorough comprehension of complex subjects.

Integrity is essential, but as engineers, we must embrace new technologies to improve our processes. As a result, we must address the shortcomings and figure out how to employ ChatGPT and other artificial intelligence tools to improve engineering education. Teachers have two options: either integrate these technologies into the teaching process, which calls for updating curricula and instructional materials, or they can prohibit their use and force students to perform frequently laborious manual computations (Nikolic,2023).

Education should always foster critical thinking and questioning skills and impart knowledge (Kanwal, 2023). We may maintain the spirit and calibre of education by including AI as an additional tool that supplements human direction rather than replaces it. It will maintain the moral imperative of providing students with a complete and meaningful educational experience. (Rasul et al,2023).

6. Reviewing the Monitoring and Accountability Standards

It is imperative that educators and students genuinely understand how

ChatGPT generates and operates answers. This comprehension is the cornerstone of trust and promotes a moral learning environment. Developers, therefore, are responsible for encouraging openness in AI models and guaranteeing that ChatGPT's core mechanisms are understandable and user-friendly. Furthermore, when the AI's reasoning is involved, explanations become crucial for promoting ethical AI use and educating people about decision-making (Yu, 2023). The challenge lies in the technological implementation and in fostering an accountable culture where educators and learners collaborate to uphold the moral standards surrounding ChatGPT's use. Within the confines of the existing assessment frameworks, educators must innovate. Effective teaching strategies include encouraging oral presentations as an alternative to formal written reports, having students work in small groups to complete cooperative group projects, having students reflect on their learning, having peer assessments, using performance-based assessments (like science experiments, art projects, or mock trials), and having students create webpages, videos, and animations. We must be willing to explore newer teaching pedagogies' than multimedia projects, personal stories, or metacognitive thoughts to avoid long or short-term impact of AI (Gimpel et al. 2023).

To meet each student's requirements and preferences, universities should include them in creating and applying NLP models. Colleges should educate their staff members to use and adjust to new technologies and giving students the tools and assistance they need to use the models successfully. Academic institutions should make sure that these NLP models are applied morally and enhance student's learning and his communication skills (Fuchs, 2023). Educators and developers ought to examine alternate techniques for upgrading educational models that do not jeopardise the value of learning (Luckin & Holmes, 2016).

7. Implications for Educators

Resistance to AI integration can hinder progress, potentially leaving some educators technologically disengaged in an ever-changing educational landscape (Ali, 2023). Since ChatGPT is developing more quickly than

academic institutions can keep up, figuring out its underlying ethics will take some time. Discussions between instructors and students are essential for formulating guidelines about students' usage of ChatGPT (Whalen & Mouza, 2023). The preparation and competence of educators are crucial to tackle the challenge of excessive use of AI tools like ChatGPT in the classroom (Singh, 2023). Embracing AI fosters innovation and adaptability, enabling educators to stay at the forefront of evolving educational practices. At the same time, teachers might need more skills and training to integrate constructive use of ChatGPT into their lessons. Appropriate training modules will make it easier for teachers to fully utilise AI, and reduce moral dilemmas (Baidoo & Ansah, 2023). Mollick & Mollick (2023) discuss how, when applied thoughtfully and carefully, AI may help teachers create new lesson plans and reduce their workload in support of five strategies that improve student learning: "helping students comprehend difficult and abstract concepts by providing numerous examples and explanations". Understanding these dynamics is crucial for students and educators to make informed decisions about the role of ChatGPT and AI in the learning process and to navigate the evolving educational landscape responsibly.

On the one hand, ChatGPT can be a useful supplemental teaching tool that frees up teachers' time for individualised instruction by easing the load of repetitive chores. However, relying too much on AI risks undervaluing teachers' crucial functions and lowering their level of direct student interaction. Finding the ideal balance between technical assistance and interpersonal communication becomes difficult (Ausat et al,2023). ChatGPT can potentially enhance student learning.

8. Conclusion

Education is greatly influenced by human engagement. Education fosters critical thinking, creativity, problem-solving skills, and the ability to comprehend things rather than simply providing facts. The aspects of education are intrinsically human; they necessitate a more complicated, loving, and dynamic environment, which technology and artificial intelligence cannot supply (Lo, 2023). We must ensure that ChatGPT and comparable

technologies serve as instruments that empower and elevate the educational journey while respecting higher education's integrity and principles (Sharma & Yadav, 2022).

The ability of generative AI technology to perform data entry, transcription, vital customer support, translation, and content creation hints at a future shift in labour, since AI may replace or outsource these professions to lower-paid foreign workers. (Sullivan et al, 2023). Given the development of AI even in workplaces, using generative AI tools in the classroom and educating students how to use them safely and effectively could help equip them to flourish in an AI-dominated job environment after school (Sharma & Yadav, 2022). We must embrace this future while maintaining the integrity and values of higher education. To do this, we must ensure that ChatGPT and related technologies are instruments that empower and enhance the educational experience. We must find out what the students think on the morality of artificial intelligence. We should make sure that every curriculum has a small section on AI usage. We may also have the responsibility to teach students that there are situations in which trying ChatGPT is acceptable and situations in which it is plainly dishonest. At the end, the importance of originality and academic integrity should be understood by all stakeholders in education.

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APPLICATION OF INTERNET OF THINGS IN INDIAN HEALTHCARE INDUSTRY

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Abstract:
Medical science and computer technology are two heterogeneous domains that are tightly integrated when it comes to building smart healthcare services. When we discuss the adoption of IoT in hospitals to improve patient experience, we observe that patients, medical staff, and hospital staff are interconnected in an IoT network. The Healthcare Internet of Things has transformed the value created for all the stakeholders in the healthcare community including patients, doctors, hospitals, and insurance providers. The book chapter explores the application of IoT in the Indian healthcare system. The benefits of the integration of IoT by major players in the healthcare industry have been discussed. Rapid disease diagnosis, improved and proactive treatment, error reduction, and better drug and equipment management have been the outcomes of the adoption of IoT in the medical domain. The study also identifies the challenges in the widespread

implementation of IoT in India such as sensor data quality and reliability, data privacy, and maintaining heterogeneous data gathered from varied connected devices. Thus, the projection is on several inventive and technological methods that have contributed to the industry's transition to the 4.0 paradigm and concentrating on these technologies as they are used in healthcare 4.0, such as the Internet of Things, big data analytics, blockchain, cloud computing, and artificial intelligence.

Keywords: Internet of Things, smart healthcare, big data, H-IoT, stakeholders, Indian healthcare

1. Introduction

An autonomous network of physical or virtual devices that may communicate with one another using the Internet Protocol is referred to as the Internet of Things (IoT). The term "Healthcare Internet of Things," which is another name for the Internet of Medical Things or "connected health," describes the application of IoT technologies to the medical industry. Predictive analytics, smart medical equipment, and remote patient monitoring are among the application cases. The market is being dominated by the IoT for healthcare globally. Numerous reasons contribute to this rise, including the existence of an established healthcare infrastructure, the expanding IoT technology adoption by healthcare providers, and the rising need for affordable healthcare solutions. Improved patient outcomes, lower costs, increased efficiency, and easier access to healthcare are just a few of the many advantages that come with IoT in the healthcare industry. The use of IoT technology is growing in importance in the battle against disease and in the endeavour to enhance global health as the globe continues to face new healthcare issues.

The four-step structure of the Internet of Things, which are steps in a process, is depicted in Figure 1. All four stages are interrelated for data to be gathered or analysed at one level to provide significance to the subsequent one. By integrating values, dynamic business possibilities and intuitions are provided (Jindal M, Karjagi R (2023).

Step 1: Installing networked devices, including video systems, detectors, monitors, actuators, sensors, and other items, is the initial step. These gadgets collect the data.

Step 2: Analog data from sensors and other devices has to be aggregated and altered to digital form to enable additional data processing.

Step 3: Preparing, standardising, and transferring the digitalized and combined data to a data centre or cloud comprise

Step 4: At the necessary level, the final data is managed and examined. By using advanced analytics on this data, decision-makers can gain useful business insights.

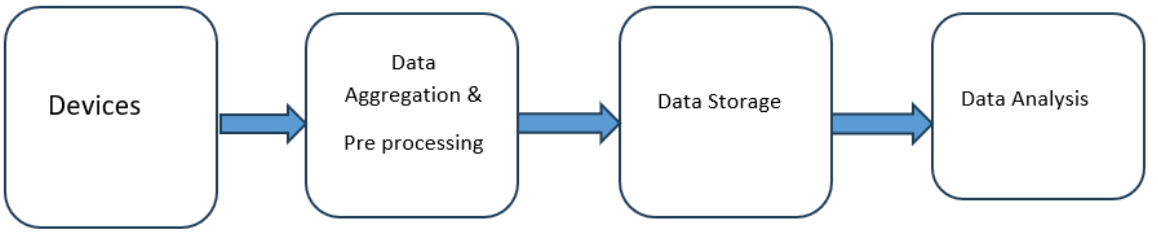

Figure 1. General IoT architecture

2. Stakeholders in the IoT healthcare ecosystem

IoT is changing the healthcare sector by reinventing how people and equipment interact to deliver healthcare solutions. Applications of IoT in healthcare benefit physicians, hospitals, insurance companies, families, and patients (Jindal M, Karjagi R.,2023).

IoT in healthcare - Patients can receive individualized care due to wearable devices like fitness bands and other devices like glucometers and cuffs for measuring blood pressure and heart rate, which can be wirelessly connected. These wearable technologies can be automated to remind users to check their blood pressure, make appointments, track their calories, and much more.

IoT for doctors: Wearables and IoT-enabled home monitoring gadgets can help doctors keep a closer eye on their patients' health. They can keep an eye on patient's adherence to treatment plans and determine whether they need emergency care. Medical staff members may engage with patients more proactively and vigilantly thanks to IoT. Doctors may use data from these devices to help them choose the best course of treatment for their patients and help them achieve their goals.

IoT for hospitals: In addition to keeping track of patients' health, IoT devices have numerous other applications in medical facilities. Real-time tracking of medical devices such as oxygen pumps, wheelchairs, defibrillators, and nebulizers can be done using the Internet of Things (IoT) that have sensors attached to them. It is also possible to analyze medical staff deployment in real-time at various sites. For hospital patients, the spread of infections is a serious worry. Patients can avoid infection with the use of IoT-enabled hygiene monitoring equipment. IoT devices also support environmental monitoring, such as monitoring refrigerator temperature and controlling humidity and temperature, and asset management tasks like pharmaceutical inventory control.

IoT for health insurance providers: Health monitoring device data may be leveraged by insurance organisations for their underwriting and claims procedures. With this data, they may identify possible underwriters and spot fraud claims. IoT devices enable insurers and consumers to have transparency in the underwriting, pricing, claims processing, and evaluation of risk processes. Consumers would be able to understand every choice, and process outcome in the context of data-driven decisions made in all operational processes via IoT capture. To encourage the use, and sharing of health data produced by Internet of Things devices, insurers may provide incentives to their clients.

3. Benefits of IoT in healthcare

Better patient care, better treatment outcomes, and reduced patient expenses are all guaranteed by IoT, which is also transforming the healthcare sector by

improving workflows and procedures, boosting productivity, and improving the patient experience for healthcare professionals. Several advantages of IoT in healthcare include:

i. Rapid Disease Diagnosis: Continuos real-time patient data monitoring allow for early disease diagnosis, potentially preventing hospital stays, re-admissions, and unnecessary doctor visits.
ii. Improved Treatment: Physicians can make evidence-based decisions and bring about complete transparency.
iii. Proactive Treatment: By allowing for continuous health monitoring, proactive medical treatment can be provided.
iv. Error reduction: Information produced by IoT devices guarantees error-free and cost-effective healthcare operations.
v. Drug and Equipment Management: Keeping track of medications and medical supplies is a major challenge in the healthcare industry. IoT sensors and devices allow these to be handled more cheaply and efficiently.

During the COVID-19 pandemic, the use of Internet of Things (IoT) technologies has proven particularly advantageous as the need for home care and telemedicine has increased to reduce hospital and clinic visits. Remote monitoring in healthcare has also led to shorter hospital stays and fewer re-admission requirements. The Internet of Things (IoT) has applications ranging from smartwatches to municipal infrastructure (smart cities), and it is driving the development of communication technologies like 5G and data analytics employing AI and machine learning. —a massive network of interconnected items gathering and processing data and carrying out tasks on their own—is getting closer to becoming a reality (Statista Market Insights, 2023).

Though Indian hospitals have traditionally trailed behind their Western counterparts in terms of IT adoption, the country's largest private hospital chains, such as Apollo, Manipal, Fortis, Max, and Narayana Health, are now emphasising the use of technology. The Internet of Things' growth in the medical sphere has led to the adoption of the technology by several healthcare organisations in the Indian market. Only a tiny portion of these have we

examined in our study. Additionally, we have tried to focus on a select group of significant IOT technology providers, such as Wipro and Philips.

4. Literature Review

4.1 Application of IoT in healthcare

The Internet of Things, or IoT (a term coined by Kevin Ashton in 1999), is a crucial component of a new wave of information technology because it combines electronics, software, sensors, and networks (Zou, 2020). It allows data gathering and sharing that can support ubiquitous services among interacting people, objects, data, and applications by bridging the gaps between the physical and digital data worlds (Economides, 2016). A collection of different communication devices that perceive and interact with one another is known as the IoT (Kumar, 2023). By examining the many difficulties and problems encountered in the past, IoT devices have caused turbulence in the field of medicinal applications (Chandy, 2019). When sophisticated Machine Learning (ML) algorithms are integrated with IoT devices, big data plays a crucial role in enabling health systems to be improved in terms of diagnosis, treatment, and decision-making. The creation of automated medical data-gathering systems may be greatly aided by the substantial amount of bio-medical data that these IoT devices can produce (Karthick, 2020). In recent years, this cutting-edge technology has been extensively studied in several application sectors, including healthcare. Presently, there are a variety of integrated devices being used, ranging from the well-known fitness trackers for consumers, like Fitbit, Millet wristbands, and Apple Watches (Dimitrov, 2016), to intelligent healthcare IoT applications that focus on mental support, medical care, health monitoring, and exercise promotion (Ma et al., 2015). In light of the recently developed cyber-physical and IoT technologies that link digital and physical objects, healthcare is progressively moving "from being driven by limited data to 360-degree, multimodal personal-public-population-physical-cyber-social big data-driven," according to Sheth et al. (2017).

A workflow model with five components consisting of question formulation, data collection, data processing, visualisation, and assessment is followed mostly to create successful Internet of Things applications (Al-rawashdeh,

2022). The foundational technologies for such smart applications include smart sensors, cloud/edge /fog computing and wireless body area networks (Dang, 2023) Even though using IoT data to extract hidden information and conclusions holds great promise for improving our lives, doing so is a challenging undertaking that cannot be completed using conventional paradigms (Zikria, 2020). This has led to the usage of AI in ongoing monitoring to assist in the diagnosis of sickness, alerting medical professionals or carers through an alert system. In addition, these devices can help in decision-making using a decision support system (DSS). The shift from an exhausting, challenging and time-consuming manual process to a smarter, digitised, and time-efficient one was one of the primary benefits of this modification.

4.2. Challenges in H-IoT

Sheth et al. (2017) investigated the fundamental components of IoT-enabled enhanced individualised healthcare and identified three H-IoT challenges: sensor data quality and reliability; appropriate heterogeneous data interpretation; and contextual understanding and data abstraction. To facilitate the widespread implementation of H-IoT systems, scalability issues need to be resolved (Kumar,2023). Data transmission in H-IoT systems is critical, hence there is an utmost need to utilise an appropriate access method to prevent packet loss. Aside from this, the dynamic nature of the majority of the current routing protocols in H-IoT systems results in poor performance besides a few notable issues with localization and coverage. Baig et al. (2019) found that data collection and processing is the most frequent issue with wearable devices after conducting a thorough assessment of IoT-based monitoring applications with an emphasis on the ageing population.

According to Brigg et al. (2019, p. 233), the prevalent problem is specifically "the delay in providing results and generating alerts due to data loss, buffering, network communication, monitoring, or processing." One commonality across the literature covered in these review studies is that, to solve the communication component of H-IoT data concerns related to inter-machine transmission; the majority of the literature has concentrated on

improvements to hardware and software. Consequently, their ability to detect the issues associated with H-IoT data when it comes to person-to-person and human-to-machine communication is limited (Maksimovic and Vujovic, 2017). Maksimovic (2018) focused on discussing the emerging fog computing and cloud computing technologies in support of healthcare-associated data gathering, analysing, and interpreting. Data confidentiality and safety are issues, particularly when IoT-enabled devices capture personally identifiable information on patient's health and well-being (Ghafur, 2019). The ownership of patient data, its moral application, and the patient's (or individual's) right to have personal data removed from a database are some of the fundamental policy arguments. Islam et al. (2015) surveyed IoT-based healthcare technologies and reviewed the state-of-the-art network architectures and platforms emphasising data security and privacy as the cornerstone in the spectrum of IoT healthcare security.

4.3. Adoption of H-IoT in India

The National Health Stack, which Niti Aayog revealed in 2018, established the architectural framework for developing health IT systems in India (Bajpai, 2020). This was further cemented with the release of the National Digital Health Blueprint (2019) and the National Digital Health Mission (NDHM) by the Indian government in August 2020. Dash (2018), has stated that the number of active medtech (devices and diagnostics) startups and SMEs in India has drastically grown over the past two decades due to the support from various Indian government agencies, including the Technology Development Board (TDB), the Department of Science & Technology's (DST), the Department of Biotechnology (DBT), BIRAC, the Millennium Alliance (an initiative supported by the DST, FICCI, and USAID), the Indo USA Science & Technology Fund (IUSSTF), the Bill & Melinda Gates Foundation, and the Wellcome Trust. These medical technology businesses mostly work in the following fields: home visits and remote health monitoring; diagnostics, especially molecular diagnostics; care and critical care and monitoring; mental health; artificial intelligence and predictive analytics; and other technologies, such as drones and vaccine carriers. Over the past ten years, a large number of new firms have emerged that are developing IoT-enabled solutions for

healthcare delivery, screening, and diagnostics. These range from wellness and chronic disease detection and management (Yostra, BioSense) to maternal and child health (CareNx, NemoCare, Sensivision, Janitri, Bempu), AI & imaging (Predible, Qure.ai; BrainSightAI; Adiuvo Diagnostics; Periwinkle), and remote diagnostics and consultation (Neurosynaptic Communications).

5. Adoption of IOT by some dominant healthcare service providers

Caselet 1 -Manipal hospitals

Manipal Hospitals and Isansys Lifecare have partnered to launch an initiative that will use the Isansys Patient Status Engine to monitor vulnerable and high-risk patients across the care areas (BW Healthcareworld, 2022). The FDA and the EU have approved the patient status engine (PSE) as a medical device regulatory (MDR) compliant solution. It is employed for wireless, remote patient management and monitoring of those who require ongoing health updates due to borderline illness. Numerous patients, according to the hospital, are on the verge of illness and require ongoing medical attention. Costs will be cut since the PSE would enable medical professionals, including nurses, to continuously monitor patients outside of the intensive care unit. The Patient Status Engine is a sophisticated technology that Manipal hospitals are the first in India to implement. It will notify the hospital if the patient's condition worsens. This platform also shows changes in the parameters that require prompt medical treatment or intervention. Apart from providing minute-by-minute EWS (Early Warning Score), which is streamed live to the central monitoring station and the caregivers' team's mobile phones, the device will assist hospitals and physicians in continuously monitoring patients' basic vitals, including blood pressure, heart rate, temperature, saturation, and ECG.

Caselet 2 - Apollo hospitals

It is making it possible for Apollo Hospitals to see patients in their entirety. The Hospital is exploring more recent tech areas like the Internet of Things (IoT). IoT is being implemented both inside and outside the hospital (Gupta S, 2017). Fitbits are an example of an IoT level. However, considering IoT as a networked healthcare environment is the second level. integrating

intelligence-equipped diagnostic and other medical technology so that their clinical and operational teams can use it to make better decisions. According to industry analysts, there is expected to be an increase in demand for the "digitalization of services" in the healthcare sector, which is consistent with trends observed in other areas including retail, hotel, and entertainment. Hospitals will soon have to serve patients throughout the digital care continuum to be able to offer the same calibre of inpatient care whenever and wherever it is needed. In the future, linked care will only involve creating an ecosystem and digital care continuum that emphasizes awareness, prevention, and rehabilitation in addition to treatment. The International Data Corp. (IDC) refers to the connected health scenario as an "Intelligence Wellness Net," wherein artificial intelligence, predictive analytics, and the Internet of Things (IoT) will all become more and more significant. The main issue shortly, according to Moduga, will be "building digital transformation as a function inside of a hospital," even if the majority of Indian hospitals have been dealing with the historical barriers of internal adoption of technologies and change management.

Caselet 3 -Apex hospitals

As the pandemic spread and the number of remote patient care cases increased, home isolation monitoring moved from a theoretical concept to a practical one. With the use of the COVID RPM platform, the APEX group of hospitals was able to monitor COVID-positive patients frequently and guarantee that they received high-quality care so that any issues would be identified promptly (Medtel Healthcare, 2023).

A few of the IOT-enabled services adopted by Apex Hospitals are listed below.

a. Personalized care with remote patient monitoring! -Remote patient care and monitoring for COVID-19 patients was the main focus of their model. Together with gadgets like blood pressure monitors and oximeters, they instructed their patients on how to use an app. Patients would monitor their vital signs and symptoms according to a timetable prescribed by their physician. The physician would also check these

vital signs, and if an abnormal value was found, an alarm would sound for both the physician and the patient's family. They also allowed daily online consultations for fifteen days. Patients need to be motivated and assisted in adhering to their regimen of tests, medications, and consultations. Additionally, the hospital also sends out reminders and messages regularly.

b. Prompt analytics and timely alerts to enable prompt action! - The hospitals created a dashboard for doctors so they could watch each patient's health individually and see an aggregated list of patients with concerning readings. This way, they could make sure that the system is simple and pleasant for doctors to use too. For each patient, the physician may customize the alert range and goal. E-prescriptions could be generated instantly, and consultations could be planned and carried out from the same platform. In conjunction with APEX, the IOT technology providers were able to guarantee that everyone has access to healthcare in the most practical way possible during a period of high patient loads and home isolation monitoring trials.

This deployment provided a means of fostering patient-doctor trust and demonstrated that provided the digitization platform is designed with the needs of both the patient and the physician in mind, at-home and remote care can improve patient compliance and guarantee improved health outcomes. For future chronic conditions like diabetes and hypertension, Apex hospitals want to put in place a remote patient monitoring (RPM) system.

Caselet 4- Fortis hospitals

The autonomous care start-up Phable from India has announced a collaboration with Fortis Hospitals Bangalore (News, BioSpectrum, 2016). AI-enabled applications for illness resolution are accessible to patients from their homes. This will benefit thousands of patients on Fortis who have long-term medical conditions. Over eighteen main chronic illnesses are supported by Phable, which employs AI to give patients individualized advice. Phable wants to make healthcare more affordable, patient-focused, and conveniently

accessible. By assisting patients with managing their medication, testing, nutrition, exercise, and other needs, their app-based virtual assistant enhances their quality of life. Phable could save lives because it can identify abnormalities in medical situations and integrate with several home-care health devices. Phable uses artificial intelligence (AI) to provide patients with tailored advice and support for more than 18 common chronic illnesses.

Caselet 5 -Narayana hospital

Honeywell is supporting Narayana Hrudayalaya, an Indian company that provides technology-driven, reasonably priced, and universally accessible healthcare. A non-binding memorandum of understanding (MoU) has been struck by the two businesses to find, evaluate, and work together on prospects for Narayana's digital transformation (Rogerson, 2022). By utilizing its expertise in sensors, Honeywell's sensing healthcare solutions division can provide hospitals, clinics, and senior living facilities with tools and software that enhance clinical care coordination, communication, and teamwork. It became evident during the pandemic that healthcare organizations require technology that can be easily incorporated into their current systems and procedures to reduce errors in workflow, improve patient satisfaction, and increase organizational flexibility. By enhancing their efforts in fire safety and real-time patient monitoring, Honeywell's sensor-based solutions will set the standard higher for other competitors of Narayana Hospitals. Nurses are spending less time visiting patients' beds to capture their specific health information at the Bengaluru Heart Hospital operated by Narayana Health. This is because the hospital now has about 700 beds with connected sensors that track vital indicators like pulse, temperature, blood pressure, and respiration rate and send the data to cellphones and specialized computers. Hospital patients aren't able to witness the sensors in action, though. They are applied to their chest and resemble patches used for electrocardiograms. The sensors within these patches are connected to a real-time health monitoring system (RTHMS) created by the Indian division of US tech giant Honeywell, relaying data via the Internet of Things (IoT). over the cloud to a dashboard that is accessible on PCs and mobile devices.

6. Study of Philips' health tech strategy-giant in IOT technology provider

In addition to including goods ranging from electric toothbrushes to MRI scanners, Philips' broad definition of healthcare encompasses customers, patients, providers, and caregivers across the healthcare continuum (Rourke, 2022). From consumer electronics to COPD treatment and sleep apnea machines, Philips offers a range of home-use items. With 31% of health monitor owners owning a Philips product, the company is the most well-liked producer of specialized health monitor devices in the US market, according to our Consumer Wearables, Use Cases and Feature Importance survey. As one of the largest suppliers of medical devices worldwide, Philips has a strong emphasis on the healthcare system. From sophisticated imaging systems to vital sign monitors, many of its products are connected to the Internet of Things. But as a result of the healthcare system's response to the pandemic, Philips is shifting more in the direction of home-based patient monitoring. For instance, in the first quarter of 2021, Philips purchased BioTelemetry, a company that offers remote cardiac monitoring and diagnostics, and Capsule Technologies, a manufacturer of software for remote patient monitoring. The HealthTech Products That Philips Offers

a) Being a prominent player in the medical IoT market Philips offers a variety of healthtech products. With the use of data and video feeds, distant ICU physicians can provide real-time patient consultations through the institution's 15-year-old electronic intensive care unit (ICU), which serves as an addition to the bedside ICU team. To maximize patient care in a time-sensitive setting, it integrates A/V technology, data visualization, predictive analytics, and data reporting. This allows healthcare personnel in different places to share information. The business positions eICU as an adjunct to the bedside care team, not a substitute, to lower mortality, duration of stay, and healthcare costs.

b) Another service-based product is the well-known predictive maintenance program called the Philips e-Alert system, which keeps an eye on the company's cutting-edge imaging equipment. It uses IoT-enabled sensors to keep an eye on diagnostic imager settings, which are examined remotely by Philips Healthcare staff. This enables service workers to diagnose issues

remotely using software or in person before they worsen. Furthermore, technicians of all machines of that type anywhere in the globe can access the sensor data produced by a malfunctioning machine, which they can subsequently use to ensure that those devices function more smoothly.

c) Philips offers a range of both new and existing services, most of which are built on the HealthSuite Platform and all of which progressively use IoT. They consist of:
    i. Oncology pathways: tailoring cancer treatments by gathering data from various sources at various locations via the Internet of Things.
    ii. Integrated diagnostics: By combining artificial intelligence and imaging with radiology, pathology, cardiology, and oncology processes, using the cloud, malignancies can be monitored more closely.
    iii. Cardiology pathways: Using cloud-connected sensors, mobile cardiac outpatient telemetry enables the provision of cardiac care from the hospital to the home.
    iv. Acute telehealth: a hospital-based, cloud-native technology that enables medical professionals to keep an eye on up to sixty patients at once in various contexts.
    v. Patient flow: An AI-powered cloud-native application that combines all medical data a patient produce while receiving treatment, providing improved patient status monitoring.

7. Conclusion

IoT has become a new paradigm for enhancing medical treatment. The digital and information revolution may bring benefits to the health sector through the use of IoT technology (Keikhosrokiani, P. 2021, 2019). Well-being, more affordable treatment, and sustainable healthcare services are the key advantages of the Internet of Things (Al-rewashed, 2022). Healthcare 4.0 is being achieved by the entire ecosystem by implementing Industry 4.0 techniques (Ahmed, 2022). Several inventive and technological methods have contributed to the industry's transition to the 4.0 paradigm concentrating on these technologies as they are used in Healthcare 4.0, such as the Internet of

Things, big data analytics, blockchain, cloud computing, and artificial intelligence. The wearable medical gadgets offer a continuous means of gathering comprehensive data on the wearer's physiological characteristics, including heart rate, electrocardiogram (ECG), body temperature, and galvanic skin response (GSR). The elderly with chronic illnesses or impairments have an easier time using the home-based healthcare strategy thanks to the Internet of Things (IoT) based healthcare system. IoT in healthcare is predicted to be widely used, although it will mostly help city dwellers, who are probably able to communicate more extensively than those who live in more locations that are rural. Several challenges may arise while deploying infrastructure that supports the IoT in rural locations (Kerrison, 2023). Due to signal obstructions and low population density, telecommunications companies have less motivation to invest in building substantial infrastructure in these locations. Consequently, IoT devices commonly encounter low communication quality in most rural locations, such as limited bandwidth and inconsistent connectivity, which can be problematic for real-time data use.

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ENHANCING ORGANIZATIONAL RESILIENCE IN HEALTHCARE: DYNAMICS IN DIGITAL ERA

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Abstract: Organizational resilience is critical for healthcare institutions to sustain and adapt in the digital era. This chapter explores the multifaceted dimensions of enhancing organizational resilience, focusing on the challenges and opportunities of digitalization. It conceptualizes organizational resilience in healthcare and its relevance amidst technological advancements and evolving stakeholder expectations. It then explores the antecedents and consequences of organizational resilience, underscoring the vital role of digital technologies in enhancing this resilience. It highlights how healthcare institutions can utilize data analytics, telemedicine, and automation to enhance operational efficiency and sharpen decision-making skills. It explores the evolving healthcare landscape in this digital age, addressing the hurdles and embracing the possibilities of digitalization. Practical and actionable

strategies are laid out for healthcare organizations to bolster their resilience, effectively utilize digital technologies, and nurture a culture committed to continuous improvement. Aimed at providing insightful and pragmatic guidance, this chapter navigates the complex domain of organizational resilience in healthcare, viewed through the lens of our digital era.

Keywords: organizational resilience, digital era, healthcare, digital technologies, telemedicine

1. Introduction

We live in an age where technological advancements are reshaping our world, and nowhere is this more evident than in healthcare. Today's healthcare organizations are at the forefront of tackling diverse challenges, from managing public health emergencies to integrating innovative digital technologies. At the heart of every healthcare organization's success in this challenging landscape is organizational resilience – their extraordinary ability to survive and thrive, even when the going gets tough.

We're living in what feels like a brand new era for healthcare, thanks to the digital revolution. It's as if we've stepped into a future where every aspect of how we provide, manage, and experience healthcare has been transformed. Let's pause and think about the seismic shifts in healthcare – electronic health records (EHRs), the rise of telemedicine, breakthroughs in AI, and the magic of data analytics. These innovations have revolutionized healthcare, but they're not without their challenges. We're talking about safeguarding patient data, keeping up with ever-changing regulations, and matching the relentless pace of technological progress.

This chapter will thoroughly explore the digital age's transformative impact on organizational resilience in healthcare. We're diving into how healthcare organizations can embrace and navigate the digital revolution. It's not just about enhancing patient care; it's about carving out and maintaining a robust presence in the rapidly evolving healthcare landscape.

1.1 The significance of organizational resilience in healthcare

In healthcare, resilience isn't just a buzzword; it's the essence of survival. Picture healthcare organizations as vessels in a storm, relentlessly tackling many challenges and disruptions. They're charting their course through unexplored waters, confronting everything from sudden public health emergencies to the whirlwind of tech advancements and shifting patient expectations.

In this dynamic and unpredictable realm, a healthcare institution's resilience determines its triumph or downfall. But resilience here goes beyond merely holding the fort. It's about dynamically enhancing operations, breaking new ground in innovation, and continually raising the bar in care delivery, regardless of the hurdles encountered.

1.2 The digital era's impact on healthcare

The advent of the digital era marks a watershed moment for the healthcare industry. This era has reshaped the foundational aspects of healthcare – from how care is delivered and managed to how patients experience their treatment. Breakthroughs like EHRs, telemedicine, AI-driven diagnostics, and data analytics have radically transformed healthcare organizations' operations.

These advancements present unprecedented opportunities for enhancing patient care but also introduce new challenges. The pace of innovation has accelerated, adding to the complexity of healthcare systems. Issues such as data privacy, security, and the need to comply with evolving regulations and keep up with rapidly changing technologies pose considerable challenges for healthcare organizations.

At this crucial intersection, healthcare organizations are tasked with harnessing digital technology to improve patient care, streamline operations, and boost efficiency, all while reinforcing their resilience to ensure continuity of care and adaptability amidst digital disruptions.

1.3 Conceptualizing organizational resilience

In the context of the healthcare sector during the digital era, organizational resilience is a complex and essential concept. To thoroughly understand it, it's crucial to delve into its definition, intricacies, and critical components.

1.3.1 Defining organizational resilience in healthcare

Organizational resilience in healthcare is defined as the ability of a healthcare organization not just to withstand and recover from disruptions and adapt, learn, and prosper in an ever-evolving and challenging environment. It transcends simple recovery from adversities; it involves proactive anticipation, response, and embracing of change to improve patients, stakeholders, and the organization.

Disruptions in healthcare can take many forms, such as pandemics, technological advancements, regulatory changes, and shifting patient expectations. Organizational resilience involves mitigating the immediate impact of these disruptions and using them as catalysts for growth and innovation. It is a dynamic, forward-looking concept that recognizes the constant nature of change in healthcare and embraces it as an opportunity for ongoing development and growth.

An essential aspect of resilience in healthcare is its focus on maintaining the highest possible quality of care even in the face of disruptions. It acknowledges that patient well-being remains the central mission of healthcare organizations, and resilience strategies are aimed at safeguarding and enhancing this mission.

1.3.2 Key components and attributes

Several vital components and attributes underpin organizational resilience in healthcare, each contributing to an organization's ability to thrive amid challenges. These components include:

- **Leadership:** Leadership is paramount in attaining organizational resilience. Leadership encompasses the skill to influence, persuade, and mobilize individuals towards a common objective. Resilient healthcare

organizations are led by individuals who exemplify adaptive leadership qualities. Leaders must navigate crises effectively and inspire their teams to embrace change and innovation. They set the tone for a culture of resilience.

- **Culture:** The culture within an organization significantly influences its resilience. Cultures that value adaptability, continuous learning, and open communication are fundamental. In such environments, employees feel empowered to express concerns, share insights, and actively problem-solve during challenging times.

- **Adaptability:** Agility and adaptability are essential for healthcare organizations to respond to disruptions effectively. This involves swiftly assessing situations, making informed decisions, and being willing to adjust strategies as needed. Adaptability is essential in the fast-evolving healthcare sector.

- **Preparedness:** True resilience in healthcare goes beyond mere reaction; it's about being thoroughly prepared. Healthcare organizations must be proactive, identifying potential challenges ahead of time. Developing comprehensive contingency plans and regularly conducting drills and simulations are essential to ensure readiness for any situation.

- **Capacity for Innovation:** At the core of every resilient healthcare organization is an inherent ability to innovate and adapt. In today's world, adopting new technologies and innovative approaches isn't just a bonus; it's essential. This adaptability is critical, not just for responding to unforeseen disruptions but also for enhancing patient care.

- **Collaboration:** Collaboration is a cornerstone of resilience within and across healthcare organizations. Building strong partnerships with other healthcare providers, government agencies, and community organizations often paves the way for developing practical solutions to wide-ranging challenges.

Within the realm of healthcare, the essence of organizational resilience is both intricate and profound. Picture it as a richly woven tapestry, crafted from threads of steadfast leadership, a supportive and nurturing culture, the agility to adapt, strategic foresight, an unwavering drive for innovation, and a commitment to unity. This harmonious blend of qualities equips healthcare organizations with the strength to tackle challenges head-on, push the boundaries of excellence in their mission, and consistently deliver outstanding care to the communities they serve.

2. Antecedents of organizational resilience

In this section, we explore the foundational aspects that form an organization's resilience bedrock when faced with various challenges.

2.1 Leadership and resilient healthcare organizations

In the heart of a healthcare organization that stands tall against adversity, you'll find the true essence of its leadership. These leaders' role in forging a resilient culture and steering their team through tough times is remarkable. Their unique ability to inspire, pivot strategies deftly, and guide their organization toward recovery and growth, especially during crises, sets them apart.

The leaders who truly make a mark are those with the knack for making bold, decisive decisions, flexibly adapting to ever-changing scenarios, and presenting a clear and compelling vision. These traits lay the groundwork for trust and commitment within their teams. Take, for example, the COVID-19 pandemic. It was a time when the strength and clarity of leadership truly shone through, making an indelible impact on the course of events. Leaders like Dr. Anthony Fauci and Dr. Tedros Adhanom Ghebreyesus stood out for their steadfast and evidence-based guidance, crucial in maintaining public trust during those unprecedented times.

2.2 Organizational culture and adaptability

The resilience of a healthcare organization is significantly shaped by its culture. Cultures that value adaptability, lifelong learning, and transparent

communication are essential, especially in periods of significant change. These are the environments where resilience is not just a concept, but a lived practice, enabling organizations to thrive amidst challenges.

Organizations with resilient cultures excel in managing crises, fostering innovation, and experimenting with new solutions. They create spaces where employees feel comfortable voicing concerns and sharing ideas, significantly boosting problem-solving capabilities in critical situations. A standout example is the Mayo Clinic, known for its patient-centric and team-based approach, demonstrating exceptional agility in adjusting to healthcare's changing landscape and overcoming various obstacles.

2.3 Information technology infrastructure

In today's digital age, a robust IT infrastructure is vital for the resilience of healthcare organizations. Effective IT systems are essential for managing and analysing critical data, crucial in decision-making during disruptions and ensuring continuous patient care and operational flow.

Healthcare facilities with advanced EHR systems and data analytics could efficiently track and respond to the COVID-19 pandemic, optimize resources, and adapt to evolving patient needs.

2.4 Strategic planning for resilience

Strategic planning plays a critical role in fortifying healthcare organizations. It encompasses proactive scenario planning, risk assessments, and strategies for mitigating potential disruptions. Such planning is pivotal for organizations to weather crises and maintain high-quality care standards.

During the COVID-19 crisis, those with solid strategic plans could swiftly adapt, efficiently allocate resources, modify care delivery models, and implement necessary infection control protocols.

3. **Consequences of organizational resilience**

This section will focus on the tangible outcomes of resilience in healthcare institutions and their wider communities.

3.1 Stakeholder satisfaction and trust

The resilience of a healthcare organization is intrinsically linked to the satisfaction and trust of its stakeholders. Stakeholders encompass patients, their families, healthcare providers, partners, and the broader community. When healthcare organizations demonstrate their ability to handle disruptions effectively, stakeholders develop confidence and trust in their ability to provide consistent care and support.

For example, a hospital that can maintain quality care during a crisis, such as a natural disaster, meets the expectations of patients and their families and fosters trust within the community. Likewise, when healthcare providers feel supported by resilient leadership and a culture of adaptability, their job satisfaction increases, which, in turn, positively impacts patient care.

3.2 Improved patient outcomes

Organizational resilience profoundly impacts patient care outcomes. Healthcare institutions prioritizing resilience are better equipped to maintain a high standard of care even in the face of disruptions. For instance, resilient healthcare organizations can swiftly adapt their care models, allocate resources efficiently, and deliver essential services during natural disasters or pandemics.

Studies and real-world examples consistently show that such resilience-driven practices improve patient outcomes. For instance, during the COVID-19 pandemic, healthcare organizations that were resilient in their response saw lower mortality rates, quicker patient recovery times, and a reduced burden on healthcare systems. Timely and effective responses, informed by resilient strategies, led to better patient care experiences.

3.3 Enhanced organizational performance

Organizational resilience positively affects patient care and enhances organizational performance. Resilient healthcare organizations are more efficient in resource allocation, cost management, and decision-making. They are better prepared to navigate financial challenges that may arise from disruptions.

Furthermore, a reputation for resilience can attract top talent, foster partnerships, and enhance the organization's competitiveness. Healthcare institutions that have invested in building resilience often find themselves better positioned to thrive in competitive healthcare markets.

Organizational resilience in healthcare doesn't just bring about noticeable improvements in patient care; it also nurtures aspects that, while intangible, are vitally important, such as stakeholder trust and the organization's reputation. By adopting resilience-driven strategies, healthcare organizations successfully navigate through tough times and significantly enhance their long-term performance and impact.

4. **The role of digital technologies in enhancing resilience**

In the current digital era, an array of digital technologies is at the disposal of healthcare organizations, offering them substantial opportunities to bolster their resilience. These technologies are instrumental in responding swiftly to immediate disruptions and strategically preparing for future challenges. Let's delve into three critical areas where digital technologies are making a significant difference in enhancing resilience.

4.1 Data analytics and informed decision-making

Data analytics is a pivotal element in building resilience within the healthcare sector. By leveraging the immense power of data, healthcare organizations can unearth crucial insights, anticipate trends, and base their decisions on solid information. Particularly during disruptive events, data analytics becomes a powerful tool, enabling organizations to monitor disease spread (Wu et al., 2020), allocate resources efficiently (Baiyewu, 2023), and pinpoint populations at higher risk (Saliu et al., 2022).

Take the COVID-19 pandemic, for instance. Healthcare institutions lean heavily on data analytics to project case surges (Lee et al., 2021), model the impact on healthcare systems, and strategically allocate essential resources like ventilators (Bertsimas et al., 2021) and personal protective equipment (PPE) (Ma & Tsai, 2020). This capability to analyse data in real-time granted

healthcare leaders the agility to make rapid, informed decisions, playing a crucial role in safeguarding both patients and healthcare workers.

4.2 Telemedicine and remote care

Telemedicine and remote care technologies have emerged as essential elements in the resilience toolkit of modern healthcare. These technologies break down the barriers of physical distance, ensuring that patients have access to crucial medical services even when it's challenging to reach a healthcare facility. Especially vital during public health crises, telemedicine facilitates routine care and becomes a lifeline, enabling healthcare professionals to assess and monitor patients remotely, thereby curbing the risk of spreading infections.

A prime example of telemedicine's impact was witnessed during the COVID-19 pandemic. With lockdowns and quarantine measures in place (Alsaffar et al., 2020), telemedicine bridged the gap between patients and healthcare providers. Patients could receive medical advice from the safety and comfort of their homes, which alleviated the strain on healthcare facilities and played a critical role in minimizing the virus's transmission.

4.3 Automation and efficiency

Automation in healthcare goes beyond just streamlining operations; it's a critical factor in bolstering the sector's resilience. Healthcare organizations can free up valuable human resources and ensure the continuity of critical functions during disruptions by automating routine tasks and processes. Automation also reduces the risk of errors and increases the speed of response.

For example, automated systems can streamline appointment scheduling, billing, and administrative tasks, allowing healthcare staff to focus on patient care during crises. Robotic process automation (RPA) can be deployed to manage repetitive tasks, such as processing insurance claims, ensuring that vital revenue streams remain uninterrupted even in challenging times (Talukdar et al., 2023).

5. **Challenges and Opportunities in the Digital Era**

While digital technologies offer significant advantages in enhancing healthcare resilience, they also present challenges and opportunities that healthcare organizations must navigate.

5.1 Navigating regulatory and ethical considerations

Adopting digital technologies in healthcare introduces complex regulatory and ethical considerations. Compliance with data protection regulations, such as the Health Insurance Portability and Accountability Act (HIPAA) in the United States or the General Data Protection Regulation (GDPR) in Europe, is paramount to protect patient privacy and data security.

Moreover, ethical considerations surrounding AI, telemedicine, and data analytics require careful navigation. Healthcare organizations must strike a balance between innovation and ensuring that digital technologies are used responsibly and ethically.

5.2 Building resilience in a changing landscape

The digital era is characterized by rapid change and innovation. Healthcare organizations must continuously adapt to emerging technologies, evolving patient expectations, and shifts in healthcare delivery models.

Resilience planning must incorporate a dynamic approach that allows organizations to anticipate and respond to new challenges. It involves investing in staff training to keep pace with digital advancements, fostering a culture of innovation, and being prepared to adjust strategies as the digital landscape evolves.

6. **Practical strategies for healthcare organizations**

Healthcare organizations must employ practical strategies encompassing culture, technology, and a commitment to continuous improvement to enhance organizational resilience in the dynamic digital era.

6.1 Cultivating a culture of resilience

Building a resilient organizational culture starts with leadership. Leaders should exemplify resilience by remaining calm and adaptive during crises, fostering open communication, and encouraging employees to learn from setbacks. This cultural shift encourages employees to embrace change, share concerns, and collectively work towards innovative solutions.

Practical steps include offering resilience training, organizing scenario-based drills to test responses to disruptions, and recognizing and rewarding employees who exemplify resilient behaviours.

6.2 Leveraging digital tools effectively

Effectively leveraging digital tools requires a strategic approach. Healthcare organizations must align digital investments with their resilience goals. This involves:

- Conducting technology assessments to identify gaps and opportunities.
- Implementing robust cybersecurity measures to protect sensitive data.
- Ensuring interoperability and data sharing among digital systems.
- Regularly updating digital infrastructure to remain current with evolving technologies.

Healthcare organizations can improve their resilience by using digital tools to streamline operations, enhance patient care, and support decision-making.

6.3 Continuous improvement and learning

Resilience is an ongoing process that thrives on learning and improvement. Healthcare organizations should establish mechanisms for continuous improvement, learning from disruptions, and adapting strategies accordingly. This includes:

- Conducting post-incident reviews to identify areas for enhancement.
- Encouraging staff to share insights and feedback.
- Fostering a culture of innovation and experimentation.

Healthcare organizations are steadily becoming more adept at handling future disruptions. This is mainly due to their commitment to continuous learning

from past experiences and their willingness to tweak and improve their strategies proactively.

7. The future of organizational resilience in healthcare

As we journey into the digital era, the landscape of organizational resilience in healthcare is ever-evolving, brimming with opportunities and challenges. For healthcare organizations aiming to flourish, several key aspects need consideration.

7.1 Adapting to emerging technologies and trends

Healthcare stands on the cutting edge of emerging technologies (Osama et al., 2023). Innovations like the Internet of Medical Things (IoMT), genomics, precision medicine, and AI-driven diagnostics are reshaping the industry. Organizations must stay agile and adaptable to leverage these technological advancements and navigate the associated ethical, privacy, and security concerns.

7.2 Anticipating future challenges

Healthcare organizations must be proactive in anticipating future challenges. Employing methods such as scenario planning, conducting risk assessments, and horizon scanning (Woods, 2021) can provide valuable insights into potential future disruptions. Moreover, forging collaborations with government entities, research institutions, and industry partners is crucial in developing robust strategies for risk mitigation.

The future of organizational resilience in healthcare is inextricably linked to the sector's capacity to embrace digital innovation, cultivate a culture of adaptability and ongoing learning, and proactively confront the challenges that lie ahead. Healthcare organizations can navigate the constantly changing healthcare terrain by taking strategic steps to cultivate resilience and provide quality care despite uncertainty.

8. Case studies and stakeholder involvement

This section delves into real-world case studies of healthcare organizations

that have successfully enhanced their resilience in the digital era. Additionally, we emphasize the importance of stakeholder perspectives and engagement in this resilience-building process.

8.1 Case study

8.1.1 Narayana Health: navigating the COVID-19 crisis with digital resilience

Narayana Health (2020), headquartered in Bengaluru, India, is one of the country's most renowned healthcare providers. Known for its affordable and quality healthcare services, Narayana Health operates a vast network of hospitals and clinics across India.

When the COVID-19 pandemic hit India in early 2020, healthcare organizations faced unprecedented challenges. The sudden surge in cases strained healthcare infrastructure, and hospitals had to adapt rapidly to provide care while ensuring the safety of patients and healthcare workers.
Narayana Health leveraged digital technologies to enhance its resilience during the pandemic. Here are vital aspects of their digital resilience strategy.

1. **Telemedicine Expansion:** Recognizing the need for remote consultations, Narayana Health rapidly expanded its telemedicine services. Patients could consult with healthcare providers online, reducing the burden on physical facilities and minimizing the risk of virus transmission.

2. **AI-powered Triage:** Narayana Health introduced AI algorithms to streamline patient triage. These AI-driven tools were instrumental in identifying patients at high risk, prioritizing their care accordingly, and optimizing the allocation of healthcare resources.

3. **Data Analytics for Predictive Modelling:** Using data analytics for predictive modelling was another strategic move by Narayana Health. They could proactively plan their resources by analysing disease trends and patient flow patterns. This foresight ensured that critical

equipment and medical supplies were readily available when most needed.

4. **Remote Monitoring:** Narayana Health set up remote monitoring solutions for patients in home isolation. This allowed patients to keep track of their vital signs and receive medical guidance without needing to visit the hospital, alleviating the burden on hospital resources.

5. **Supply Chain Optimization:** Digital tools were also employed to streamline the supply chain. This ensured the timely distribution of crucial medical supplies and PPE to various facilities, an essential component during the pandemic.

The effectiveness of Narayana Health's digital resilience strategy during the pandemic was evident in several key outcomes:

- Efficient delivery of patient care, even during the peak of COVID-19 cases.
- A significant reduction in the risk of virus transmission within healthcare facilities.
- Improved resource allocation, driven by data-informed decisions.
- Enhanced patient engagement through the use of telemedicine and remote monitoring services.
- The development of an adaptable and resilient healthcare model, ready to face future challenges head-on.

Narayana Health's experience highlights the critical role of digital resilience in healthcare, especially in times of crisis. Their strategic application of digital tools, encompassing telemedicine, AI, data analytics, and remote monitoring, was pivotal in maintaining high-quality care amidst the challenges brought on by the COVID-19 pandemic.

8.1.2 Aster DM Healthcare: innovating for enhanced healthcare accessibility

Aster DM Healthcare (2023) is a leading healthcare conglomerate based in Dubai, with a robust footprint in India. This organization runs an extensive

network of hospitals, clinics, and pharmacies, all dedicated to delivering top-tier healthcare services.

Faced with the challenge of making healthcare more accessible, particularly in the less-served areas of India, Aster DM Healthcare focused on expanding its reach. Their goal was to bridge healthcare disparities and elevate health outcomes for a diverse population spread across vast geographical areas.

At the heart of Aster DM Healthcare's approach was a digital resilience strategy, hinged on using technology to extend healthcare services without compromising quality. Here's a closer look at their strategic approach:

1. **Expanding Telehealth Services:** Aster DM Healthcare took a significant step by launching a comprehensive telehealth program. This initiative has been a boon, especially for remote and underserved patients, bridging the gap caused by geographical distances. Now, these patients can quickly consult with specialists and primary care physicians, avoiding the long travels that were once necessary for specialized care.
2. **Deploying Mobile Health Clinics:** They also introduced mobile health clinics, a true game-changer equipped with the latest diagnostic and telemedicine technology. Reaching into the heart of remote villages, these clinics deliver essential healthcare services and specialist consultations right to the doorsteps of those in need. The deployment of these clinics represented a significant leap forward in making healthcare accessible.
3. **Implementing EHRs:** By adopting EHR systems, Aster DM Healthcare significantly streamlined patient data management. This strategic move has facilitated quick and secure access to patient information throughout the Aster network, significantly enhancing care coordination and patient safety.
4. **Establishing a Health Information Exchange:** Another critical development was setting up a secure health information exchange

platform. This system has been instrumental in efficiently sharing vital patient data and medical records across different facilities, improving the continuity and quality of care.

5. **Engaging with Communities:** Recognizing the essential role of community involvement in healthcare, Aster DM Healthcare has proactively organized health awareness campaigns, preventive health check-up camps, and educational programs in collaboration with local communities.

The impact of these initiatives was profound:

- **Broadening Healthcare Access:** There's been a notable improvement in healthcare service access for remote and underserved communities. This shift is critical, as it has brought essential healthcare services to those who previously faced substantial barriers to access.
- **Strengthening Care Coordination and Safety:** Implementing EHRs and a health information exchange system has transformed the landscape of care coordination and patient safety. These technological innovations have made it possible to efficiently share and utilize critical patient information across various healthcare settings.
- **Elevating Community Health Engagement:** Another critical achievement is increased community engagement and awareness in health matters. Through active participation and focus on health education, Aster DM Healthcare has played a vital role in enhancing health outcomes. This proactive approach has led to a deeper understanding of community health issues and promoted more proactive health and wellness strategies.

Aster DM Healthcare's case study underscores the impact of digital resilience on healthcare accessibility. The organization extended their reach to underserved communities by strategically implementing telehealth, mobile clinics, and health information exchange. This initiative exemplifies how technology can be harnessed to bridge healthcare disparities and provide quality care to India's diverse and geographically dispersed populations.

8.2 Stakeholder perspectives and engagement

Engaging stakeholders is essential and fundamental to enhancing organizational resilience within healthcare organizations. This section explores how healthcare institutions actively involve various stakeholders in resilience-building efforts, including patients, healthcare providers, administrators, and the broader community.

8.2.1 Patient perspectives

The insights gained from patients who have experienced healthcare resilience are invaluable. By sharing their perspectives, we can understand how resilient healthcare organizations have positively impacted their care, trust in the healthcare system, and overall satisfaction.

Patients who have encountered resilient healthcare organizations often highlight (Hollnagel & Braithwaite, 2019):

1. **Consistency of Care:** Resilient healthcare institutions maintain consistent care quality, even during disruptions. Patients value this continuity, ensuring their health and well-being are not compromised when unforeseen challenges arise.
2. **Communication:** Effective communication during disruptions is a hallmark of resilient healthcare. Patients appreciate being informed about changes in care delivery, appointment rescheduling, and safety measures. This transparency fosters trust.
3. **Accessibility:** Resilience often involves using digital tools, such as telemedicine, to ensure continued access to care. Patients appreciate the convenience and accessibility these technologies offer, particularly in times of crisis.
4. **Timely Responses:** Resilient healthcare organizations respond promptly to patient needs, addressing critical medical concerns without unnecessary delays.

5. **Safety Measures:** Patients recognize and value the safety measures by resilient organizations, such as enhanced infection control protocols and safeguards to protect vulnerable populations.

Healthcare organizations can better understand the elements contributing to resilience from the user's standpoint by examining patient perspectives, further enhancing their ability to provide patient-centred care.

8.2.2 Healthcare providers

The experiences and perspectives of healthcare providers actively involved in resilience-building efforts provide crucial insights. These professionals are at the forefront of care delivery. They can show how training, leadership support, and the effective use of digital tools influence their ability to deliver care during disruptions.

Healthcare providers often emphasize (Gröschke et al., 2022):

1. **Training and Preparedness:** Training programs and preparedness initiatives empower healthcare providers to respond effectively during disruptions. They appreciate organizations that invest in their development and provide the tools and knowledge needed to navigate challenging situations.

2. **Leadership Support:** Effective leadership is vital in resilience efforts. When healthcare providers feel supported by their leaders, they are more confident in their ability to deliver care under adverse conditions.

3. **Digital Tools:** The strategic deployment of digital tools, like telemedicine and EHRs, is a game-changer in maintaining care continuity during disruptions. There's a growing appreciation among healthcare providers for organizations that skilfully integrate technology to elevate patient care. This integration streamlines processes and ensures that high-quality care can be consistently delivered, even in challenging times.

4. **Collaboration:** The backbone of resilient healthcare organizations is their ability to foster collaboration among healthcare providers. It's the synergy of effective communication and teamwork that enables these organizations to deliver well-coordinated care, especially during disruptive events.

By tapping into healthcare providers' collective experiences and insights, organizations can refine their strategies, making them more attuned to the real-world challenges encountered in the trenches of care delivery.

8.2.3 Community engagement

Engagement with the broader community is a pivotal aspect of resilience-building for healthcare organizations. This goes far beyond the confines of their physical facilities, encompassing partnerships with local communities, educational initiatives, and outreach programs. Community engagement often involves (Simmons et al., 2011):

1. **Partnerships:** Collaborative efforts with local organizations, schools, and community groups strengthen resilience by creating a network of support and resources.
2. **Education:** Healthcare organizations play a vital role in educating the community about health and wellness, emergency preparedness, and access to care. Informed communities are more resilient.
3. **Outreach:** Outreach initiatives can include health fairs, vaccination drives, and disaster preparedness workshops. These efforts enhance community preparedness and resilience.

Community involvement contributes to a holistic approach to resilience. Healthcare organizations build trust and establish themselves as integral parts of the broader healthcare ecosystem by actively engaging with the community.

9. Recommendations for policymakers and healthcare leaders

This section offers actionable recommendations for policymakers and healthcare leaders to support and drive resilience enhancement in the health-

care sector within the digital era.

9.1 Policy implications for resilience enhancement

Policymakers must consider these actions to enhance resilience in the healthcare sector during the digital age.

- **Data Governance and Privacy:** Develop and enforce robust data governance frameworks that balance the need for data-driven decision-making with patient privacy and security. Regulations should provide clear guidance on collecting, sharing, and using healthcare data.
- **Telemedicine Regulation:** Create flexible regulatory frameworks that promote telemedicine adoption while ensuring quality care and patient safety. Simplify licensure processes for healthcare providers practising across state or national borders through telemedicine.
- **Cybersecurity Standards:** Establish cybersecurity standards and incentives for healthcare organizations to protect patient data and digital infrastructure. Collaborate with cybersecurity experts to develop guidelines and best practices tailored to healthcare.
- **Interoperability and Data Sharing:** Encourage interoperability among healthcare IT systems to enable seamless data sharing between organizations. Implement policies that promote standardized data formats and protocols to enhance collaboration and continuity of care.
- **Investment in Digital Infrastructure:** Allocate resources and incentives to support healthcare organizations in upgrading and maintaining their digital infrastructure. Policymakers should recognize digital technology as a critical component of healthcare resilience.

By implementing these recommendations, policymakers can create an enabling environment that enables healthcare organizations to enhance their resilience through digital means.

9.2 Leadership strategies for the digital era

In the fast-evolving landscape of the digital era, healthcare leaders face unique challenges and opportunities. Here are some tailored strategies to navigate these waters:

- **Emphasis on Digital Literacy Training:** Investing in ongoing digital literacy training is crucial, not just for leadership but for all team members. Grasping the full spectrum of what digital technologies can and cannot do is a cornerstone for informed decision-making.
- **Forging Strategic Partnerships:** By partnering with tech enterprises, research institutions, and other healthcare entities, leaders can keep their finger on the pulse of digital advancements. Such collaborations are invaluable in sparking innovation and bolstering organizational resilience.
- **Adopting Agile Change Management:** It's about more than just implementing new technologies; it's about nurturing an adaptive culture. Effective communication about the reasons behind digital initiatives, involving staff in the process, and supporting them through these changes are crucial.
- **Integrating Scenario Planning:** Leaders should integrate scenario planning into their strategies, working collaboratively with their teams to predict and prepare for digital disruptions. This foresight is vital in ensuring uninterrupted, high-quality care.
- **Upholding Ethical Leadership:** In the digital realm, ethical leadership is paramount. Setting and adhering to clear ethical standards, especially regarding patient-centred care, data privacy, and transparent decision-making processes, is essential.
- **Encouraging Innovation and Experimentation:** Fostering a culture where innovation and experimentation are the norms can greatly benefit healthcare organizations. Leaders should cultivate an environment where trying out new digital solutions is encouraged, thereby enhancing overall resilience.

Healthcare leaders can effectively guide their organizations by championing these initiatives, fostering a culture that thrives on digital innovation and adaptability in the face of the unique challenges of the digital era.

10. **Conclusion**

In this section, we consolidate the key takeaways from this chapter and emphasize the importance of resilience in navigating the shifting healthcare setting.

10.1 Key takeaways

1. Organizational resilience is paramount in healthcare, enabling institutions to adapt, survive, and thrive in disruptions.
2. The digital era has brought opportunities and challenges to healthcare, necessitating a focus on digital resilience.
3. Leadership, organizational culture, IT, and strategic planning are foundational to resilience.
4. Resilience positively impacts patient outcomes, stakeholder satisfaction, and organizational performance.
5. Digital technologies, including data analytics, telemedicine, and automation, enhance healthcare resilience.
6. Navigating regulatory and ethical considerations is crucial in the digital era.
7. Cultivating a culture of resilience, effective use of digital tools, and continuous improvement are practical strategies for healthcare organizations.
8. Anticipating emerging technologies and challenges is critical to the future of resilience in healthcare.

10.2 Paving the way forward: resilience in a dynamic healthcare environment

As healthcare evolves in the digital era, enhancing organizational resilience remains critical. Building on the insights and strategies presented in this chapter, the way forward involves:

- Embracing digital innovations while upholding ethical standards and patient privacy.

- Fostering a culture of adaptability, innovation, and continuous learning.
- Engaging stakeholders, including patients and the community, in resilience-building efforts.
- Collaborating with policymakers to create an enabling environment for digital resilience.
- Proactively anticipating and preparing for emerging challenges in healthcare.

Resilience is not a destination but a journey. It is a continuous commitment to adapting and thriving in an ever-evolving healthcare landscape. Healthcare organizations can continue to deliver quality care and remain responsive to the needs of their stakeholders by integrating digital technologies, cultivating resilience at every level, and staying attuned to emerging trends.

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DIGITAL EMPOWERMENT FOR COMMUNITY ENTREPRENEURSHIP: EXPERIENCES OF RURAL SILVASA

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Abstract: Social progress can be achieved through consolidated effort and cooperation among multiple stakeholders. "Two Indias" is a common expression used by politicians, journalists, and scholars to highlight the stark socioeconomic disparities and inequalities that exist within India. To translate this, we can safely say that a large number of Indians are still excluded from the growth story. Silvassa in the Union Territory of Diu and Daman is one such case in point. The study aimed at exploring the opportunities and challenges in digitizing capacity-building initiatives and efforts towards women empowerment with rural inhabitants in the Silvassa region. A multiple case study methodology for analyzing the phenomenon under study.

This is a part of the CSR initiative supported by a corporate organization and implemented by a local NGO. The programme was launched in 2018 in Silvassa, with a vision for holistic community development and sustainable impact. The initial results corroborate the hypothesis that digitalization is one of the key drivers of change that significantly enhances the quality of learning of the target beneficiaries. The report provides a detailed record of opportunities and challenges in digitizing capacity-building initiatives that helped bring visible change from 2021 to June 2023. It analyses the contribution of digital technologies to the Community Capitals Framework in bringing about a visible impact in the community.

The experience in the first phase is quite encouraging. The use of digital technologies has resulted in a positive impact in the community. Digitalization of capacity-building initiatives has enabled several possibilities for the SHG members and also helped in refining the relationships among different players in the entrepreneurial ecosystem. However, continued interventions are necessary till the SHGs are independently running their projects and sustainable socio-economic development.

Keywords: Collaboration, digital access, Community Entrepreneurship, Social Impact, Community Capitals Framework (CCF)

1. Introduction

In a global economy, innovation and growth are primarily driven by digital technologies. However, integration of these technologies with the business processes is not sufficient (Bartolomé et al., 2022) the availability and accessibility of these technologies hold significance. There has to be a joint effort by all the parties concerned to have an inclusive policy in bringing about digital literacy in all sections of society (Laar et al., 2020). Achieving desired outcomes easily through the use of technology is termed Digital literacy. To thrive in this rapidly changing environment digital competence is pivotal (Vrontis et al., 2022). It is a known fact that digital technologies have the potential to change the landscape of development. Digital competence enhancement plays a pivotal role in technology adoption (Bartolomé et al.,

2022). Digital competence and technological adoption trigger and enable entrepreneurial behavior (Kraus et al., 2022). The development of human capital either through formal or informal processes has a positive effect on entrepreneurship and the growth of the firm (Jiang et al., 2020). To drive economic growth and development in rural areas of India, community entrepreneurship has immense potential (Pathak & Mukherjee 2020). This requires coordinated efforts by local actors, government officials, and professionals within organized civil society (Gupta et al., 2020). When implemented cooperatively, these practices can bring about significant and positive changes in the entrepreneurial landscape of India. Adoption of communication technology for capacity building besides spreading awareness about available opportunities among the SHGs, also helps in boosting collaborations among stakeholders (Almansour, 2022).

2. Literature Review

Community Capitals Framework for Examining Community Entrepreneurship

Research on community entrepreneurship has gained traction in recent years as it plays a positive role in social, environmental, and sustainable entrepreneurship (Buratti et al., 2022). In favor of a new entrepreneurial approach, community entrepreneurship creates value for the economy, society, and the environment (Vedula et al., 2022). Overall Entrepreneurship has been looked at as a tool to generate employment and economic development (Kraus et al., 2020). Community Capitals Framework (Emery & Flora 2020) provides a lens through which helps in initiating and sustaining the process of change.

Social Capital or Networks

Role of Self Help Groups (SHGs), Non-Governmental Organizations (NGOs), Academic communities, and digital technologies in developing Social Capital -

This includes non-governmental organizations (NGOs), community groups, and other civil society organizations like temple trusts, clubs, etc. A study conducted in Lebanon found that NGOs positively moderated the success of community entrepreneurship, as well as two other factors, including

psychological factors and environmental factors (Raimi et al., 2023). In modern India, NGOs play a pivotal role in mobilizing local resources, creating an appropriate ecosystem, and helping local entrepreneurs identify opportunities (Mukherjee, 2009). Community entrepreneurship has the potential to drive economic growth and promote social development in India, particularly in underserved and marginalized communities. Adopting digital technologies will accelerate (Rippa & Secundo 2019), (Sousa et al., 2019) the development of the entrepreneurial ecosystem. It empowers individuals and communities to take ownership of their economic activities for a stable future and can help create more inclusive and sustainable economic systems (Parwez & Patel 2022). Sustainable socio-economic growth can be possible with NGOs employing their digital capabilities (Ibrahim et al., 2021). NGOs play a critical role in co-creating projects leveraging CSR funds to implement policies and making it work at the grassroots. The academic community brings value to the efforts through its research capabilities, objective outlook, and global perspective. They bring the capability to catalyze growth and development through forging these partnerships between the players (Pedro Jacobi, 2006).

Human Capital/Capacity Building

Role of Digital literacy in developing Human Capital -

According to Shrivastava & Kennelly (2013), place-based enterprise (PBE) offers "a potentially important means of fostering ecological and social sustainability in local communities." However, the engagement of academic researchers in more business-related activities can be challenging. (Tuunainen & Knuuttila, 2009). Capacity building focuses on the development of skills and competencies that would be helpful in community entrepreneurship (Panzarella et al., 2023). These studies can provide valuable insights into the processes of knowledge creation and sustainable development, and the necessary stakeholder involvement in promoting innovation and impact in Indian scenarios (Carayannis et al., 2012).

Political Capital

Role of Digital technologies in the betterment of governance-

The government leads the process by providing the legal and regulatory

framework for social development by introducing and designing policies for societal development. Using digital technologies enables access to information and therefore aids in spreading awareness about opportunities provided by the government (Chohan & Hu 2022). Thus, enabling development at the grassroots. Banks and financial institutions provide the channel for the financial management of the projects and enable government schemes in the region. Digitalization can open new funding possibilities for community entrepreneurs (Bertoni et al., 2022).

Financial Capital

Corporate organizations, banks, and other financial institutions- Examining the role of Digital Technologies -

Corporate organizations, banks, other financial institutions, and individual philanthropists support the policies through CSR funds, the lifeline for projects, and play a role in designing impact-oriented CSR projects with inputs from other players. Digitalization can bring about economic, ecological, and social benefits (Jiang et al., 2023) that directly or indirectly positively (Zheng et al., 2023) affect their CSR activities.

Cultural Capital

Cultural capital plays a crucial role in regulating the behavior of people because it is the way people understand what is accepted in the community and thus prefer confirming with it. The dominant groups in the community are privileged and cultural capital influences the way creativity and innovations are nurtured that influences community entrepreneurship (Emery et al., 2020). Cultural Capital also predicts the extent of resilience that the community displays which is another important aspect of building a robust ecosystem.

Built Capital

The infrastructure supporting entrepreneurial activities can catalyze entrepreneurial activity (Bhatt et al., 2023).

Proposed Framework for Study (Fig: 1.1)
Digital Capital

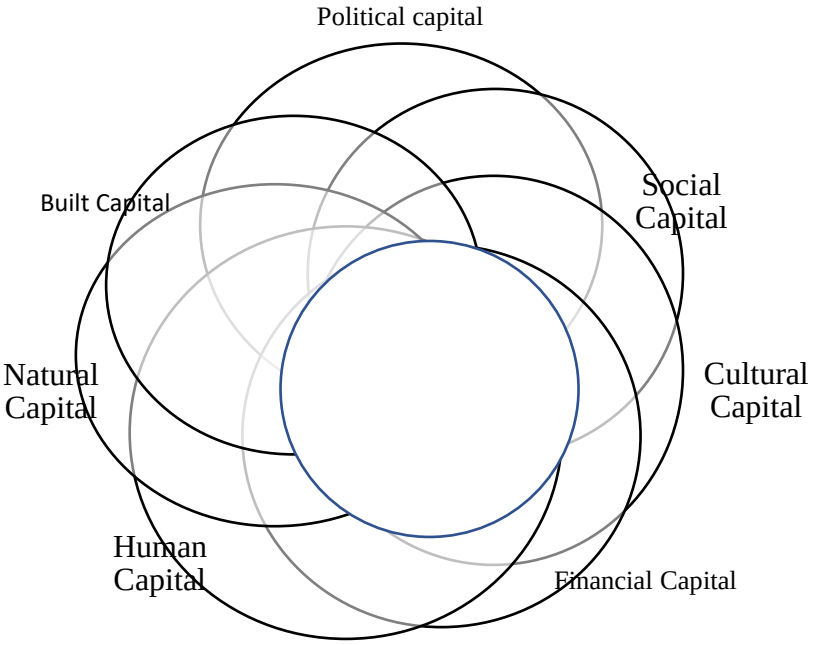

Image Credits: Modified by the authors to include Digital technologies (Emery & Flora 2020)

A Holistic Model for the Research Study (prepared by the authors)

Natural Capital

This includes weather conditions, climate, geographical location, and the natural resources available that can be used to enhance the entrepreneurial ecosystem. Natural Capital has a major influence on industries like tourism, travel, and other agriculturally dominant sectors (Rani et al., 2021).

Digital Capital

Internet, smart devices - Digital Capital is central to all other capitals as it has an impact on all other capitals therefore, analyzing the role of digital technologies in spiraling up community entrepreneurship helps policymakers

and all other players in focussing on areas that are relevant areas of improvement (Ragnedda et al., 2020). Digital Capital also helps eliminate inequalities and establish an inclusive ecosystem (Robinson et al., 2020).

The Communities Capital Framework highlights the interdependence of all other capital forms and is a comprehensive approach that can be adopted to gauge the well-being and development of a community as a whole. By taking an inclusive approach, this framework helps in ensuring sustainable community development. This paper highlights how digitalization helps in the enhancement of all these capitals and thus in developing the entrepreneurial ecosystem as a whole. Change in any capital can trigger change in the other (Gomez, 2021). Moreover, as identified by Gutierrez et al., 2009, sustainable development in the community can be brought about by a conscious effort by any of the players.

3. Background/General Landscape in Silvassa

Historically, Silvassa was the headquarters of Dadra and Nagar Haveli, which was under Portuguese occupation. It remains the headquarters of the Union Territory. It enjoys a coastal environment as well as green forested terrain. About 41% is covered by forest land, and the district also enjoys a coastline. The tribal population faced exploitation due to corruption by Portuguese officials as well as the local moneylenders. Some of the major tribes in the region include Warlis, Kokana, Dhodia, and Dhublas. Land-locked between Maharashtra in the south and Gujarat in the north, the region gained freedom from the Portuguese on August 2, 1954. On January 26, 2020, the Union Territory of Daman and Diu were merged to form one Union Territory with Dadra and Nagar Haveli, while Silvassa continues as the headquarters (https://dnh.gov.in/).

Many large companies have their manufacturing units here, making it an industrial zone. Some of the companies are Castrol, Hindalco, Balmer & Lawrie, Sleepwell, Neelkanth Plastics, Suryoday Industries, and others to name a few. The drastic difference in the overall lifestyle, landscape, and people in the industrial zone and the rural areas becomes obvious to a visitor

to this place. This difference calls for the need for interventions oriented towards equitable opportunity for communities in the semi-urban and rural areas in the region. To develop the ecosystem for equity and inclusion, the authors recommend the application of the helical model where multiple stakeholders play a collaborative role with the vision of holistic and sustainable impact.

The authors recommend adopting digital technologies in the development of community entrepreneurship through self-help groups.

4. Project description

The pilot project demonstrates how digital technologies were pivotal in bringing about coordinated efforts between the funding body, implementing agency, government body, and academia in generating observable and positive impact. In many projects in India and elsewhere in the world, it would be observed that efforts towards social upliftment are done without coordination between these players, leading to duplication of efforts, wastage of resources, incomplete work, and an unsustainable impact. Using digital technologies in these capacity-building initiatives can mitigate duplication of efforts. In September 2022, the research team proposed a customized plan for continued engagement with the community at Silvassa to be able to create financial independence and socio-economic growth for the women. At each stage how digitalization helped in the consolidation of efforts is being described. This project explores how digital literacy catalyzed capacity-building initiatives and social innovation in rural areas in India. A pilot is attempted in rural Silvassa. The model examines the application of digital technologies in enabling community entrepreneurship. It also explores the possibilities of employing digital technologies in catalyzing the collaborations among all the key players in the Community Capitals Framework in bringing about change in society- academia, industry, government, civil society, financial institutions, and other agencies. The roles of the players may be summarised as follows:

5. Methodology

The study is based on experimentation and field experience using earlier research in different parts of the world. Case studies are the best way to study a complex social phenomenon (Felsberger & Reiner 2020). The case method also helps in "retaining meaningful real-life characteristics." When the boundaries between the phenomenon and its context are not very clear, the case study method is an empirical inquiry that investigates a contemporary phenomenon in depth and explains its real-life context (Rashid et al., 2019). Different actors, like industry, NGOs, and local governments, have been actively operating on the ground in rural Silvassa, with minimal impact. This could be because a major catalyst, i.e., academia was missing in the helix (Singh & Garg, 2018; Jaiswal & Datta, 2020). The impact of digital technologies was chosen as the primary focus of this study to gain a comprehensive understanding of the research questions at hand.

The study aims to gather and analyze data to examine the challenges and opportunities of utilizing digital technologies for community entrepreneurship and women empowerment. The study looks at the following objectives:

i. To explore the challenges and opportunities of digital technologies in Human Capital development thus contributing to community entrepreneurship.

ii.

iii. To examine the role of digital technologies in the Community Capitals Framework in bringing about a visible change in the community
To assess the impact of digital technologies on the quality of learning.

Table 1: Mapping of the thrust areas, objectives, and research questions:

Thrust Areas	Objectives	Research Questions
Challenges and Opportunities in using digital technologies for human capital	Exploring the challenges and opportunities of adopting digital technologies in	RQ1. What are the factors that facilitate sustainable Human Capital development?

development	Human Capital Development	
Role of Digital Technologies in Community Capitals Framework	To examine the role of digital technologies in facilitating relationships among all seven community capitals.	RQ2. How can digitalization contribute to the implementation of government policies at the grassroots? RQ3. How can digitalization contribute to the development of social capital?
Considering how digital technologies impact the quality of learning	To examine the feasibility of using digital mediums for Capacity-building programs	RQ4. Can the use of digital technologies improve the quality of capacity-building training programs?

6. Data collection

Primary and secondary data were collected to assess the impact of digital technologies on the ground. While secondary data is based on published literature in indexed journals, primary data is based on first-hand information from all the key players, including the target community. Data collection was done in phases primarily through interviews and observations. details are given in the table below.

Interviews and Focus Group Discussions

The researchers have conducted in-depth focus group discussions with some of the key stakeholders, particularly using three primary methods of data collection:

1. Unstructured interviews of the NGO field staff, RSETI Director, community members
2. Participant observations

3. Document and media analysis - Websites, documents, start-up pitches, videos, blogs, and other social media sites.

Interviewing and recording, documenting the progress of the work on the ground, and discussions with different stakeholders can be found on the sheet enclosed.

These interactions, too, are facilitated by academia. The data collection tools included open-ended questions in the unstructured interviews, leading to qualitative responses and further data points. Observations on the field were built into the process of capacity building, motivation, and idea-seeding activities with the community as well as the other players.

The SHG scheme in India was envisioned to promote community entrepreneurship amongst the womenfolk. The scheme advocates regular savings, regular meetings, and discussions as a critical step in this process. Several cities and regions have adopted the ecosystem approach through industry-academia partnerships and engagement with the government, civil society, and other stakeholders.

However, not much information or literature is available about a similar approach in Silvassa. This may indicate that either a similar effort or a similar study is not conducted in the region. Thus, the significance of this study as well as the social experiment of the community capital framework in Silvassa becomes even more relevant, especially because this model can also drive growth through social innovation in this region. This has been further validated in the following ways:

7. Observations and recommendations

Challenges and Opportunities in using digital technologies for human capital development

Opportunities:

1. Since these areas are in remote locations establishing communication with the outer world was necessary.

2. By engaging with banks, awareness was brought about opportunities available for SHGs. This helped in building confidence in the target group.

Table 2: Opportunities in using digital technologies

RQ1. What are the factors that facilitate sustainable Human Capital development?	By looking at the videos of other SHGs formation of five self-help groups, with about sixty-four women (Medha Pada, Kinri Pada, Khadi Pada, and Dungar Pada) was made easier and this has given the members a sense of identity and belonging, and the discipline of regular savings Engagement with the bank helped in building greater confidence, awareness of available support, and a willingness to work towards self-growth.

a. This has motivated other groups of women in the region to form SHGs and initiate the thought process for community entrepreneurship projects.
b. Motivated by this success, they have now undergone training in making soaps and cleaning liquids. The next step is to help them with product testing and certification so that they can accept bulk orders.
c. Two groups at Medha Pada have started their training in making paper bags.
d. The group at Kinri Pada is undergoing training for cloth bags, hand gloves, etc. They received support from civil society in cash and kind – sewing machines, fabric, sewing kits, etc.

Role of Digital Technologies in Community Capitals Framework

All the seven capitals in the community capital framework are indirectly or directly influenced by digital technologies.

Help in overcoming geographical boundaries

Table 3: Contribution of Digital Capital towards other Capital frameworks

S.No	Type of capital	Description	Contribution of Digital Capital
1	Human Capital	Competencies and skills of the members of the society	Online training for awareness about female hygiene and sales training was organized with trainers from Kolkata for Shiv Shakti Sakhi Mandal at Khadi Pada after which the members started reselling women's health and hygiene products.
2	Social Capital	Network or the relationships between different players in the ecosystem	Brought about better coordination among players as access to information would be better. The underserved, local community is mostly identified as the target beneficiary for CSR projects. The societal culture, behavioral traits, norms, and beliefs directly impact the extent of results for the projects undertaken in the region. For example, it needs to be understood that though the womenfolk are proactively hardworking, a patriarchal stronghold persists in the padas in Silvassa. Though the participants in the Project (women) faced resistance from the male members when forming SHGs, they were resilient and stood by their decision. Another interesting practice is how the community comes together for any occasion, such as weddings or other rituals in the hamlets. The women get together for a community

Table 3: Contribution of Digital Capital towards other Capital frameworks

S.No	Type of capital	Description	Contribution of Digital Capital
			kitchen to serve the wedding guests. This helps the families involved to save on costs. This practice of mutual support is deep-rooted to the extent that one of the groups could not join a training program due to upcoming weddings in the community. An understanding of this was provided by the researchers to the training partner and the NGO, and the training program was rescheduled due to this practice. NGOs work with the local industry and local government to implement need-based CSR projects for the community and they operate based on their expertise and scope of projects. NGOs bring the essential capabilities of trained and local field staff with a capability for effective community engagement, mobilization, and motivation. However, it is seen that the work of the NGOs is limited to the CSR goals defined for the project and limited funds. If the funds stop, the work stops, and thus, the project remains incomplete or neglected. Collaboration with other players would go a long way in optimizing resources, as is seen in Project. The academic team

Table 3: Contribution of Digital Capital towards other Capital frameworks

S.No	Type of capital	Description	Contribution of Digital Capital
			identifies the training needs of the community and communicates with the NGO team who then collaborate with the local government's training body for the necessary skilling. Digital technologies played a central role in forging and catalysing relationships between players in their capacity as knowledge partners because they bring to the project, expertise, research capabilities, and a holistic, unbiased view of the situation on the ground. Their insights can make a valuable contribution to the process of decision-making by all the key players, creating a richer ecosystem. The academic team also works with the NGO and civil society to enable other support required for the community in their entrepreneurial efforts – raw material, market options for forward linkages, etc.
3	Political Capital	Devising policies for community development	Digitalization enabled access to information and thus helped in eliminating inequalities. The local government bodies are the drivers of State policies. However, the local panchayats and Zilla Parishads are limited to specific geographical boundaries and contractual or

Table 3: Contribution of Digital Capital towards other Capital frameworks

S.No	Type of capital	Description	Contribution of Digital Capital
			transferable jobs. Thus, identification of the requirements of the community usually becomes challenging. The officials maintain records about the work being done in the area and coordinate with the local industry to enable CSR activities. However, if they could use this data to coordinate with the corporations in designing their CSR programs, the impact could be amplified
4	Cultural Capital	Societal norms and how innovations and creativity are nurtured.	Digitalization helps in fostering creativity. Product testing and certification were conducted by a Chennai-based laboratory, facilitating viability to accept bulk orders. A major contribution was towards eliminating mental blocks and changing the mind-set of people.
5	Financial Capital		The CSR departments of corporations are committed to the cause and play a critical role in the entire effort, as they craft CSR projects aligned with societal needs. Organizations in India are also known to involve and incentivize their staff in social impact projects on the ground. This strengthens the entire project and generates greater impact. In addition to this, if the industrial players could work jointly, the CSR programs

Table 3: Contribution of Digital Capital towards other Capital frameworks

S.No	Type of capital	Description	Contribution of Digital Capital
			could be more impactful. This way, the utilization of CSR funds could be optimal too. Financial institutions (banks, microfinance institutions (MFIs), and Government banks like NABARD and SIDBI provide the necessary information and support required specifically for banking-related operations. FIs also facilitate various government schemes that may apply to the community. However, proactive engagement with the community members is limited, and often, the schemes do not reach the people. Usually, financial institutions get involved with the process only after the registration of the SHGs, and after the SHGs maintain a regular discipline of savings.
6	Natural Capital	Resources available, weather and climatic conditions	Digitalization helped in getting information like the type of crops that can be grown. Natural resources available etc.
7	Built Capital	Infrastructure and other facilities	Digital technologies help in getting information and getting access to places that are difficult to reach.

Table: 4 Research question 2 and 3

RQ2. How can digitalization contribute to the implementation of government policies at the grassroots?	Since the local panchayats and Zilla Parishads are limited to specific geographical boundaries and contractual or transferable jobs. Thus, identification of the requirements of the community usually becomes challenging. Digitalizing communication can help overcome this situation. Zilla parishads have digitalized the data and have stored it. The officials maintain records about the work being done in the area and also coordinate with the local industry to enable CSR activities. However, if they could use this data to coordinate with the corporations in designing their CSR programs, the impact could be amplified.
RQ3. How can digitalization contribute to the development of social capital?	Community entrepreneurship: Shiv Shakti Sakhi Mandal at Khadi Pada has got training for sales and has started reselling women's health and hygiene products. The training and interaction with the sales community and customers have helped them experience the freedom that comes with having their income, however small. An online training was conducted for this group with an NGO at Kolkata. Digitalization helped in changing their mind-set of these women.

Recommendations

The pilot was possible due to CSR funding. However, to ensure continued impact till the target beneficiaries achieve self-reliance, continued support in the form of funding as well as other resources (network, training, forward and backward linkages, financial management for the community projects, and most importantly, access to digital technology) is required from all the players. Academia can play a central role in enhancing the digital literacy of the community.

8. Conclusions

Digital technologies and academia play a central role in forging and catalyzing relationships between players in their capacity as knowledge partners because they bring to the project, expertise, research capabilities, and a holistic, unbiased view of the situation on the ground. Using digital technologies helped in reducing geographical distance and delivering knowledge where it is required. Community entrepreneurship can be accelerated with the use of digital technologies. Focussing on the improvement of digital literacy levels will positively impact digital competency which is an essential element for success in any domain. It can also be seen that a major contribution of digital technologies was in the change that it brought about in the thought process of these women.

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DIGITAL TRANSFORMATION IN SUPPLY CHAIN MANAGEMENT: ENGAGING STAKEHOLDERS FOR SUCCESS

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Abstract: A supply chain refers to all the steps involved in creating products by transforming them into goods and delivering them to the end consumers through various stakeholders. In today's world, the work is ongoing to find the best methods for supply chains to become more responsive and sustainable. To achieve this, digitalization creates an excellent platform to increase performance on all dimensions, ultimately benefiting all stakeholders. Digitalization happens through steps where the current situation is analyzed, forming a blueprint to incorporate digitalization in the existing supply chains. After this, managing the supply chain becomes a significant task and, thus, helps us to mitigate the risks involved. This chapter discusses the existing supply chains, followed by the pathway to achieve digitalization. Then, the performance majors are sketched to understand the supply chain's increased performance. Finally, the Top trends in supply chain digital transformation are discussed to know more about what this digital world offers to transform supply chains.

Keywords: Supply Chain, Digital transformation, supply chain stakeholders. Artificial Intelligence (AI) and Machine Learning (ML)

1. Introduction

In the ever-evolving landscape of global commerce, the fusion of technology and supply chain management has emerged as a transformative force, redefining traditional paradigms and reshaping how businesses operate. The journey toward digital transformation in supply chain management is not merely a technological evolution but a holistic organizational shift, where the active participation of stakeholders becomes the linchpin for success. This introductory note serves as a gateway into the multifaceted world of "Digital Transformation in Supply Chain Management: Engaging Stakeholders for Success," a comprehensive exploration that delves into the symbiotic relationship between cutting-edge technology adoption and the strategic engagement of stakeholders.

1.1. Setting the stage: The changing landscape of supply chain management

It is crucial to understand the broader context within which these changes occur to better comprehend the transformation journey. The realm of supply chain management, once characterized by linear processes and separate transactions, has now evolved into an interconnected ecosystem. The traditional divisions between manufacturers, suppliers, logistics providers and end consumers gradually dissolve, creating a collaborative approach. Technology acts as the driving force behind this evolution – an innovating entity that consistently brings forth possibilities and challenges. The convergence of technologies like blockchain, artificial intelligence, and the Internet of Things (IoT), among others, has given birth to an era in supply chain management. It is an era marked by unprecedented visibility, real-time data analytics, and transformative capabilities that extend from the factory floor to the end consumer.

1.2. The crucial role of stakeholder engagement: a paradigm shift

At the heart of this digital transformation lies a fundamental paradigm shift in the role of stakeholders. Stakeholders are no longer passive observers but active participants in the journey toward a digitally transformed supply chain. This shift is imperative, recognizing that successful digital initiatives require more than deploying advanced technologies; they necessitate a collaborative

effort where internal and external stakeholders collectively drive innovation, embrace change, and align their goals with the broader organizational vision. Stakeholder engagement, therefore, becomes a strategic imperative rather than a peripheral consideration. It encompasses diverse participants – from C-suite executives shaping the organizational strategy to frontline employees executing day-to-day operations, from suppliers integral to the upstream processes to end consumers whose expectations increasingly shape the downstream dynamics. Each stakeholder group holds a unique vantage point and potential contribution to the success of digital initiatives.

1.3. Unveiling the technological tapestry: blockchain, AI, IoT, and beyond

As one navigates the landscape of supply chain digital transformation, it is essential to unravel the technological tapestry that underpins this revolution. Blockchain, celebrated for its decentralized and immutable ledger, promises to transform supply chain transparency, traceability, and security. It is a technological cornerstone that ensures that every step in the supply chain journey, from raw material extraction to the end product on the shelf, is recorded with unprecedented accuracy and transparency. Artificial Intelligence (AI), another luminary in this technological ensemble, introduces a new dimension of predictive and prescriptive analytics. AI algorithms, fuelled by vast datasets, can forecast demand patterns, optimize inventory management, and enhance decision-making processes. The predictive insights offered by AI empower organizations to proactively adjust strategies and navigate the volatile terrain of modern markets. The Internet of Things (IoT), with its constellation of interconnected devices and sensors, provides real-time visibility into the physical realm of supply chain operations. From monitoring the condition of goods in transit to tracking the performance of machinery on the factory floor, IoT enriches decision-makers with granular insights that were once unimaginable. These technologies, among others, collectively paint a picture of a supply chain ecosystem that is more efficient and fundamentally different in its capabilities and potential. The challenge, however, lies not just in adopting these technologies but in orchestrating them seamlessly to create a symphony of efficiency and innovation.

1.4. Strategic stakeholder engagement: A balancing act

The successful implementation of transformation is heavily predicated on the involvement and alignment of diverse stakeholders. While adopting technology is essential, ensuring that each stakeholder shares a vision and is willing to triumph over ability limitations is equally crucial.

One of the hurdles in this process is the resistance to exchange that regularly arises for the duration of tremendous ameliorations. Whether it involves changing strategies or introducing technology, stakeholders might feel uneasy stepping out of their comfort zones. This bankruptcy explores techniques to cope with this resistance, emphasizing conversation change management tasks and fostering a tradition that embraces innovation. Clear communication channels become the arteries through which information flows, promoting understanding and collaboration. From frontline workers to top-level executives, stakeholders must be equipped with the knowledge and context required to comprehend the implications of digital transformation on their roles and responsibilities. Beyond communication, the engagement of stakeholders in decision-making processes is paramount. It is an acknowledgement that the collective intelligence of the organization surpasses the insights of any individual. Inclusive decision-making enhances the quality of decisions and fosters a sense of ownership and commitment among stakeholders.

1.5. Case studies: Real-world success stories

The chapter weaves a tapestry of real-world case studies illustrating successful supply chain digital transformations to bring theory into practical perspective. These cases span industries and geographies, offering tangible examples of how organizations navigated the complexities of digitalization while ensuring that stakeholders played a central role. From e-commerce giants streamlining their logistics operations to multinational corporations securing their supply chains through blockchain, these cases provide valuable insights into the challenges, strategies employed, and outcomes. They serve as beacons of

inspiration and learning for organizations contemplating or undergoing digital transformation journeys.

1.6. Looking ahead: future trends in supply chain digital transformation

As we stand on the precipice of the future, the chapter peeks into the crystal ball to explore the trends that will shape the next frontier of supply chain digital transformation. Artificial intelligence and machine learning are projected to continue their ascent, offering predictive and prescriptive insights that empower organizations to proactively anticipate and respond to market dynamics. Collaborative ecosystems and platform integration are expected to redefine the interactions between stakeholders. Sustainability and ethical considerations will become integral components of supply chain strategies, aligning businesses with the values of socially conscious stakeholders. The chapter paints a forward-looking canvas, urging organizations to adapt to current trends and to become architects of the future supply chain landscape. It is a recognition that the most advanced technologies are only as potent as the collective commitment of the people who harness them. As organizations embrace the challenges and opportunities of supply chain digital transformation, they are beckoned to not only navigate the complexities but also forge a path toward a future where stakeholders and technology harmonize to create supply chains that transcend boundaries, foster innovation, and drive sustained success in the digital age.

2. Understanding digital transformation in supply chain management

In supply chain management, the clarion call for digital transformation echoes with the promise of unprecedented efficiency, agility, and innovation. Digital transformation represents more than technology integration into traditional processes; it signifies a seismic shift in the foundations of supply chains. This note delves into the multifaceted landscape of understanding digital transformation in supply chain management, exploring its fundamental principles, key drivers, and the transformative impact it heralds for organizations navigating the complexities of the modern business environment (Dillmann, 2016).

2.1. Defining digital transformation:

At its essence, digital transformation in supply chain management encapsulates the comprehensive integration of digital technologies to enhance and optimize every facet of the supply chain lifecycle. From procurement to distribution, the digital transformation journey encompasses the reimagining of processes, the adoption of advanced technologies, and the cultivation of a data-driven culture. It is a strategic and holistic approach that transcends mere Automation, aiming to unlock new dimensions of efficiency, resilience, and responsiveness (Dillmann, 2016).

2.2. The core pillars of digital transformation:

Understanding digital transformation in the supply chain requires an exploration of its core pillars, each contributing to the overarching objective of creating a more agile and intelligent supply chain ecosystem.

2.2.1. Connectivity and visibility:

At the heart of digital transformation lies the imperative for enhanced Connectivity and visibility. Organizations leverage technologies like the Internet of Things (IoT) and real-time tracking systems to create a seamless data flow across the supply chain network. This interconnectedness not only eradicates silos but also provides stakeholders with unparalleled visibility into the status, location, and conditions of goods in transit.

2.2.2. Data-driven decision making:

Digital transformation empowers organizations with a wealth of data generated at every touchpoint in the supply chain. This data becomes the bedrock for informed decision-making, predictive analytics, and optimization. Machine learning algorithms and artificial intelligence tools sift through vast datasets to uncover patterns, anticipate demand fluctuations, and enhance the accuracy of forecasts.

2.2.3. Automation and robotics:

Automation is a linchpin in the digital transformation narrative, liberating supply chain professionals from manual, repetitive tasks. Robotic Process

Automation (RPA), autonomous vehicles, and robotic systems in warehouses redefine operational efficiency. By automating routine processes, organizations reduce human error and unlock substantial time and resources for strategic endeavours.

2.2.4. Collaborative platforms and ecosystems:
The digital transformation of supply chain management fosters collaboration on unprecedented scales. Cloud-based platforms, collaborative software, and integrated ecosystems enable seamless communication and coordination among stakeholders, from suppliers to manufacturers to distributors. This collaborative ethos extends beyond organizational boundaries, creating an interconnected global supply chain network.

2.2.5. Customer-centricity and personalization:
Understanding digital transformation necessitates recognizing the shift towards a customer-centric paradigm. Advanced technologies enable organizations to tailor products and services to individual customer needs. Personalization, facilitated by data analytics and customer insights, enhances customer satisfaction and drives demand forecasting and inventory optimization.

2.3 Key drivers of digital transformation:
Several vital drivers propel organizations toward embracing digital transformation in supply chain management (Al Mashalah et al., 2022; Gong, 2023; Liere-Netheler et al., 2018):

2.3.1. Market dynamics and globalization:
The evolving dynamics of global markets and the interconnectedness of supply chain networks necessitate a more responsive and adaptable approach. Digital transformation becomes a strategic imperative to navigate the complexities of a globalized supply chain landscape.

2.3.2. Consumer expectations and experience:
Shifting consumer expectations, influenced by the rise of e-commerce and

digital experiences, drive organizations to prioritize customer-centric strategies. Digital transformation enables supply chains to meet the demands for faster delivery, real-time tracking, and personalized experiences.

2.3.3. Technological advancements:
The rapid evolution of technology, from advanced analytics to blockchain, provides organizations with a toolkit to revolutionize supply chain operations. The accessibility of these technologies acts as a catalyst for innovation and digital maturity.

2.3.4. Competitive pressures:
In an era of intense competition, organizations recognize the need to differentiate themselves through operational excellence. Digital transformation becomes a competitive advantage, allowing organizations to streamline processes, reduce costs, and deliver superior value to customers.

3. Key Stakeholders in supply chain digital transformation
Supply chain digital transformation is a multi-faceted journey that involves a diverse cast of critical stakeholders, each playing a crucial role in shaping the success of technological initiatives. The orchestration of this transformative symphony requires a collaborative effort from stakeholders across various functions, ensuring alignment with strategic goals, effective communication, and a shared vision for the future of the supply chain. This short note highlights the primary stakeholders driving supply chain digital transformation and their pivotal contributions (Al Mashalah et al., 2022).

3.1. Executive leadership:
At the helm of the supply chain digital transformation are executive leaders who set the strategic direction, allocate resources, and champion the integration of digital technologies. Their vision and commitment are instrumental in fostering a culture of innovation and driving organizational change. Executive leaders are crucial in securing the necessary investments, aligning digital initiatives with business objectives, and instilling a sense of urgency to propel the entire organization toward a digitally mature future.

3.2. Chief information officer (CIO) and its teams:

The chief information officer (CIO) and its teams are the architects of the digital infrastructure that underpins delivery chain operations. They are liable for selecting, imposing, and maintaining the technologies that power efficiency and Connectivity. From enterprise aid planning (ERP) systems to statistics analytics systems, the CIO and its groups ensure that the technological spine helps the employer's strategic targets. Their function extends to cybersecurity, ensuring the resilience of digital systems towards evolving threats.

3.3. Operations and supply chain managers:

Operational and supply chain managers are at the front lines of enforcing virtual transformation initiatives. They translate strategic goals into actionable plans, oversee everyday operations, and ensure digital tools seamlessly integrate into present tactics. Collaboration with pass-useful teams, from procurement to logistics, is critical for operational managers to optimize workflows, beautify visibility, and drive continuous development in the overall performance of the supply chain.

3.4. Procurement and supplier relations:

The procurement feature is pivotal in shaping the digital transformation journey, as it entails deciding on technology companions and answers. Procurement teams collaborate with suppliers to ensure the seamless integration of digital tools along the supply chain. Supplier relationships become a critical factor in the success of digital initiatives, emphasizing collaboration, transparency, and shared goals for mutual benefit.

3.5. Logistics and distribution teams:

Logistics and distribution teams are on the frontline of implementing digital technologies that optimize transportation, warehousing, and distribution processes. Real-time tracking, route optimization, and warehouse automation are areas where these stakeholders contribute significantly. Their engagement is critical for achieving efficiency gains, reducing lead times, and enhancing supply chain responsiveness.

3.6. Customer service and experience teams:
In the era of customer-centric supply chains, customer service and experience teams play a vital role. They ensure digital transformation aligns with customer expectations, from seamless order tracking to personalized experiences. Feedback from customer service interactions becomes valuable data for refining and improving digital tools to enhance overall customer satisfaction.

3.7. Change management and employee champions:
Change management specialists and employee champions are instrumental in navigating the human side of digital transformation. Resistance to change is a common challenge, and these stakeholders focus on communication, training, and fostering a positive attitude toward technological adoption. Their role is to empower employees, cultivate a culture of continuous learning, and bridge the gap between technology and the workforce.

4. Strategies for engaging stakeholders in supply chain digital transformation
The success of supply chain digital transformation hinges not only on implementing cutting-edge technologies but equally on the active engagement and collaboration of key stakeholders. Engaged stakeholders, from executive leaders to frontline workers, become the driving force behind successful digital initiatives. Crafting effective strategies for stakeholder engagement is, therefore, a strategic imperative. This short note outlines critical strategies for fostering collaboration and ensuring that stakeholders are not just spectators but active contributors to the transformative journey (Barrane et al., 2021; Berman, 2012; Cennamo et al., 2020; Walker & Bourne, 2007).

4.1. Establishing a clear vision and communication plan:
A well-defined vision serves as the North Star, guiding stakeholders towards the common goal of digital transformation. Executive leaders must articulate a compelling vision that aligns with organizational objectives and communicates the benefits of the digital journey. A robust communication plan ensures that stakeholders at all levels understand the vision, the rationale behind the transformation, and their role in achieving it.

4.2. Inclusive decision-making processes:
Engaging stakeholders in decision-making processes cultivates a sense of ownership and commitment. Involve stakeholders from various functions, including operations, it, procurement, and logistics, in strategic discussions and technology selection. Solicit their input, listen to their concerns, and integrate their perspectives into the decision-making process. This inclusivity fosters a collaborative atmosphere and ensures that digital solutions meet the organization's diverse needs.

4.3. Continuous training and skill development:
The digital landscape is dynamic, and stakeholders must evolve alongside it. Implementing continuous training programs ensures that stakeholders, regardless of their role, stay abreast of technological advancements. From basic digital literacy to specialized training on new tools and platforms, ongoing skill development empowers stakeholders to navigate the digital terrain with confidence.

4.4. Building a culture of collaboration:
Foster a culture where collaboration is not only encouraged but ingrained in the organizational DNA. Create cross-functional teams that bring together stakeholders from different departments to work on digital projects. Encourage open communication channels, regular feedback sessions, and knowledge-sharing forums. A collaborative culture breaks down silos, promotes idea exchange, and accelerates the pace of digital transformation.

4.5. Providing tools for transparent communication:
Effective communication is a linchpin in stakeholder engagement. Implement communication tools that facilitate transparent and real-time information sharing. Platforms for collaborative project management, instant messaging, and virtual collaboration enhance communication flows, allowing stakeholders to stay informed, share insights, and address challenges promptly.

4.6. Recognizing and celebrating milestones:
Recognition is a powerful motivator. Acknowledge and celebrate both individual and collective achievements at various stages of the digital transformation journey. Whether it's the successful implementation of a new system, the attainment of key performance indicators, or the completion of training programs, recognizing milestones reinforces the value of stakeholder contributions and fosters a positive and encouraging environment.

4.7. Addressing concerns and resistance:
Proactively addressing concerns and resistance to change is vital for sustaining stakeholder engagement. Establish mechanisms for listening to concerns, conducting regular feedback sessions, and addressing issues promptly. Creating a dedicated space for stakeholders to voice their apprehensions ensures that challenges are addressed collaboratively, preventing the build-up of resistance that can impede progress.

4.8. Measuring and showcasing success:
Quantify the impact of digital transformation initiatives and showcase success stories. Utilize key performance indicators (KPIs) to measure improvements in operational efficiency, cost savings, and customer satisfaction. Regularly communicate these successes to stakeholders, demonstrating the tangible benefits of their engagement and contributions.

5. Case studies: successful supply chain digital transformation initiatives
Real-global programs of deliver chain virtual transformation showcase the transformative strength of modern technologies and strategic initiatives. Examining successful case studies provides treasured insights into the challenges faced, strategies hired, and effects carried out by groups venturing into the digital frontier. Here, we delve into awesome case research that spotlights the triumphs of deliver chain virtual transformation initiatives, demonstrating how these endeavours have reshaped operational paradigms and more suitable general supply chain overall performance.

5.1. Amazon: redefining e-commerce logistics (Bogue, 2016)
As a global e-trade massive, amazon revolutionized the retail panorama and set new standards for supply chain performance. Amazon's virtual transformation adventure has been characterized by relentless innovation, pushed with the aid of the organization's dedication to assembling purchaser expectations with unprecedented velocity and precision.

Amazon leveraged superior technologies such as robotics, AI, and system studying to optimize its warehouse operations. The introduction of kiva robots automatic order achievement, lowering the time taken to select and per cent gadgets. AI algorithms have been employed for forecasting, ensuring that merchandise has been strategically positioned throughout successful facilities to minimize transport times.

Amazon's delivery chain digital transformation led to an incredible discount in order success instances. The organization has done equal-day and even one-hour delivery alternatives for certain products, placing a new benchmark for e-commerce logistics. The usage of statistics analytics and Automation is now not the most effective greater operational efficiency; however, it additionally allowed Amazon to offer an unbroken and purchaser-centric shopping revel in

5.2. Walmart: harnessing blockchain for food safety (tan et al., 2018)
Walmart, a retail giant with a sprawling global supply chain, faced challenges related to food safety and traceability. In response, the agency initiated a delivery chain digital transformation undertaking with a focal point on leveraging the blockchain era to decorate the visibility and traceability of its food delivery chain.

Walmart applied a blockchain-based total system that permits up-to-stop traceability of food merchandise. Each player within the supply chain, from farmers to vendors to retailers, facts transactions on the blockchain. This guarantees that the complete adventure of a food product can be traced in

real-time, lowering the time taken to discover and cope with issues inclusive of contamination or remembers.

The adoption of blockchain generation substantially improves transparency and traceability in Walmart's meals supply chain. In the event of a food protection issue, the supply of the trouble might be identified within minutes, taking into account targeted recalls and minimizing the impact on customers. The initiative showcased how blockchain will be a transformative pressure in ensuring the integrity and safety of complicated supply chains.

5.3. Maersk: revolutionizing container shipping with blockchain (park & li, 2021; wong et al., 2023)

Maersk, a worldwide leader in field shipping, faced challenges related to the inefficiencies and shortage of transparency in the complex global of international alternate and logistics. The organization launched into a supply chain virtual transformation adventure to cope with these problems and streamline its operations.

Maersk collaborated with IBM to expand a blockchain-based platform known as Trade Lens. This platform digitizes and standardizes the documentation and processes concerned with field delivery. Through smart contracts and actual-time facts sharing the trade lens, it provides a unified and transparent view of the entire delivery chain, decreasing delays and errors.

The implementation of the trade lens resulted in significant enhancements in performance and visibility for Maersk and its companions. The time required for the processing of transport documents has been reduced from days to minutes. The stronger transparency additionally caused a reduction in disputes and errors, demonstrating the capacity of the blockchain to revolutionize the historically paper-extensive procedures of global transport.

5.4. Nestlé: Ensuring product authenticity with blockchain (Rana, 2020; Schilhabel et al., 2023)

Nestlé, a multinational meals and beverage business enterprise, confronted

challenges related to ensuring the authenticity of its merchandise and building trust with purchasers. In response, the enterprise embraced the blockchain era as a method to beautify traceability and transparency in its delivery chain.

Nestlé carried out a blockchain-based machine to trace the journey of its products from supply to shelf. This involves recording each step of the supply chain, from the origin of raw materials to production, distribution, and retail. Consumers could get the right of entry to this information via scanning a QR code at the product, supplying them with insights into the product's adventure and authenticity.

The use of blockchain technology empowered Nestlé to provide clients with verifiable and transparent data about the provenance of its merchandise. This initiative no longer only addressed consumer issues about authenticity but additionally located Nestlé as a pioneer in utilizing era to enhance supply chain transparency and construct consideration.

5.5. Zara: fast fashion through the agile supply chain (Aftab et al., 2018; Berbiche et al., 2020)

Zara, a famed fast-style retailer, faced the project of assembly rapidly changing customer alternatives and handing over new styles to stores quickly. Zara's supply chain virtual transformation is centred on agility, speed, and responsiveness to market developments. Zara carried out a vertically included supply chain version, leveraging actual-time records and virtual technologies to streamline its methods. The enterprise embraced a quick-replenishment method, producing small batches of products and quickly responding to consumer calls for alerts. The integration of statistics analytics and virtual communique equipment enabled Zara to anticipate traits, alter manufacturing schedules, and decrease lead times. Zara's supply chain digital transformation allowed the organization to reap exceptional velocity in bringing new fashion trends from design to shops. The agile supply chain model ensured that Zara may want to quickly adapt to changing market demands, decreasing the risk of overstocking or neglecting opportunities. The fulfilment of Zara’s digital

tasks highlights the transformative impact of agility and responsiveness inside the speedy-fashion enterprise.

6. Measuring the impact of stakeholder engagement on digital transformation

In the intricate dance of supply chain digital transformation, the role of stakeholders as active participants and contributors is paramount. Measuring the impact of their engagement is not only a quantitative exercise but a strategic imperative to assess the efficacy of digital initiatives. This short note explores key metrics and considerations for measuring the impact of stakeholder engagement on the transformative journey, offering organizations a roadmap to gauge success and refine their strategies (Alesiuniene et al., 2021; Santarsiero, 2023; Stroumpoulis & Kopanaki, 2022a).

6.1. Operational efficiency metrics:

One of the tangible outcomes of effective stakeholder engagement is improved operational efficiency. Metrics such as cycle time reduction, lead time optimization, and on-time delivery performance provide insights into the direct impact of stakeholder engagement on streamlining supply chain processes. Organizations can assess the efficiency gains achieved in areas where stakeholders actively participate, linking their efforts to measurable improvements in operational performance.

6.2. Cost reduction and savings:

Financial impact serves as a robust indicator of the effectiveness of stakeholder engagement in digital transformation. Metrics related to decreased operational costs, inventory carrying costs, and transportation expenses showcase the tangible benefits of stakeholder-driven initiatives. By measuring the reduction in costs associated with specific projects or processes influenced by stakeholders, organizations can quantify the financial impact of engagement.

6.3. Customer satisfaction metrics:

Stakeholder engagement has a ripple effect on customer satisfaction, a pivotal aspect of supply chain success. Metrics such as order fulfilment accuracy, on-

time delivery to customers, and overall customer feedback offer insights into how stakeholder engagement contributes to enhancing the customer experience. Positive shifts in these metrics indicate that engaged stakeholders are not only improving internal processes but also delivering value to external stakeholders.

6.4. Supply chain flexibility and responsiveness:

The ability of the supply chain to adapt swiftly to changes in demand, disruptions, or market dynamics is a key indicator of resilience. Metrics related to supply chain flexibility, such as response time to demand fluctuations and adaptability to unforeseen disruptions, underscore the impact of stakeholder engagement. By evaluating how stakeholders contribute to agile supply chain practices, organizations can measure their influence on responsiveness.

6.5. Innovation metrics:

Innovation within the supply chain is a hallmark of successful digital transformation. Metrics that assess the rate of adoption of new technologies, the implementation of innovative processes, and the success of pilot projects offer a lens into the innovative impact of stakeholder engagement. By quantifying the contributions of engaged stakeholders to the organization's innovation landscape, the measurement of impact extends beyond traditional efficiency metrics.

6.6. Employee satisfaction and retention:

The positive impact of stakeholder engagement extends to the workforce. Employee satisfaction metrics, including surveys, retention rates, and overall job satisfaction, provide insights into how engaged stakeholders contribute to a positive work environment. Measuring the correlation between stakeholder engagement initiatives and employee satisfaction indicates a holistic impact on organizational culture.

6.7. Environmental and social impact metrics:

As sustainability becomes a central concern in supply chain operations, metrics related to environmental and social impact offer insights into the broader contributions of stakeholder engagement. Evaluating how stakeholders align with sustainability goals through metrics such as eco-friendly practices, reductions in energy consumption, and ethical sourcing initiatives quantifies their impact beyond operational efficiency.

7. Future trends in supply chain digital transformation and stakeholder engagement

As supply chain digital transformation continues to evolve, the landscape of future trends promises a dynamic interplay between technological innovation and stakeholder engagement. Anticipating and preparing for these trends is essential for organizations striving to stay ahead in an ever-changing business environment. This short note explores key future trends in supply chain digital transformation and the evolving role of stakeholder engagement in shaping tomorrow's supply chain Landscape (Stroumpoulis & Kopanaki, 2022b; Tseng et al., 2022; Weerabahu et al., 2022).

7.1. Integration of artificial intelligence (AI) and machine learning:

The destiny of deliver chain virtual transformation will witness a deeper integration of synthetic intelligence (AI) and system-getting-to-know (ML) technologies. These intelligent structures will now not only beautify decision-making strategies but also provide predictive analytics, enabling stakeholders to assume disruptions, optimize stock control, and streamline delivery chain operations. Stakeholder engagement will shift towards growing nuanced information on AI and ML applications, fostering collaboration among statistics scientists and supply chain experts.

7.2. Sustainability and ethical supply chains:

As environmental and social issues gain prominence, the destiny of supply chain virtual transformation may be characterized by a heightened recognition of sustainability and ethical practices. Stakeholders, such as providers, producers, and clients, will actively interact in tasks aimed toward lowering

carbon footprints, promoting circular economies, and ensuring moral sourcing. The integration of the blockchain era will play an essential position in presenting transparency and traceability across the delivery chain, fostering collaborative efforts closer to sustainable practices.

7.3. Advanced robotics and autonomous systems:

The proliferation of superior robotics and self-sufficient structures will redefine the operational panorama of delivery chains. From autonomous motors for remaining-mile delivery to robotic process automation (RPA) in warehouses, these technologies will enhance performance and decrease reliance on manual tactics. Stakeholder engagement will contain upskilling initiatives to equip people with the important understanding to collaborate seamlessly with automatic systems and make contributions to the design and implementation of robot answers.

7.4. Blockchain for enhanced traceability:

Blockchain technology will continue to play a pivotal role in ensuring enhanced traceability and transparency throughout the supply chain. Beyond its applications in financial transactions, blockchain will be leveraged to create immutable ledgers for supply chain activities, reducing the risk of fraud, ensuring product authenticity, and enhancing overall visibility. Stakeholders will actively participate in the development and adoption of blockchain solutions, fostering collaborative efforts to create a secure and transparent supply chain ecosystem.

7.5. Internet of things (IoT) ecosystems:

The future supply chain will be intricately connected through the Internet of Things (IoT). Sensors, devices, and connected systems will provide real-time data on the condition, location, and status of goods throughout the supply chain. Stakeholders across functions will engage in leveraging this wealth of data for informed decision-making, driving collaboration between its teams, operations, and logistics to harness the full potential of IoT ecosystems.

7.6. Cybersecurity as a strategic imperative:

As supply chains become more digitally connected, the future will see an increased focus on cybersecurity as a strategic imperative. The rise of cyber threats demands active engagement from stakeholders, particularly those in risk management and leadership roles. Stakeholders will collaborate to develop and implement robust cybersecurity protocols, fostering a culture of vigilance and resilience against evolving cyber threats.

8. Conclusion

Supply chain digital transformation represents a complete overhaul of conventional operational fashions, leveraging superior technologies to beautify performance, agility, and innovation. This transformative adventure includes the combination of artificial intelligence, machine mastering, and the Internet of Things to optimize tactics, improve visibility, and streamline choice-making. Key stakeholders, from govt management to frontline workers, play a pivotal role in shaping this evolution, fostering a subculture of collaboration and adaptableness. Supply chain digital transformation represents a paradigm shift in the way agencies conceive, execute, and optimize their supply chain operations. It is a strategic evolution that leverages advanced technology, facts-driven insights, and stakeholder collaboration to enhance efficiency, agility, and sustainability. From the combination of synthetic intelligence and blockchain for transparency to the deployment of IoT ecosystems and robotics for operational excellence, the adventure in the direction of digital transformation is marked by way of innovation and a holistic approach. Stakeholder engagement emerges as a vital catalyst, where leaders, employees, and companions actively make contributions to shaping a resilient and adaptive supply chain. As organizations embody those transformative technologies and collaborative frameworks, they role themselves to thrive in an era described by way of rapid trade, international Connectivity, and the vitality of sustainable commercial enterprise practices. Supply chain digital transformation is not just a technological upgrade; it is a dynamic and ongoing process that empowers organizations to navigate the complexities of the modern business landscape and orchestrate success in the ever-evolving world of supply chain

management. As the supply chain landscape continues to evolve, the future promises a seamless integration of advanced technologies, sustainable practices, and heightened cybersecurity measures, all underpinned by the active engagement of stakeholders. This dynamic interplay between technology and human collaboration positions supply chain digital transformation as a strategic imperative for organizations navigating the complexities of the modern business environment.

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DIGITAL TRANSFORMATION AT ASIAN PAINTS

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Abstract: Digital transformation is a crucial factor in the success of businesses today. It involves the integration of digital technologies into all areas of a business, from its business models to customer experiences to processes and operations. By leveraging digital technologies, businesses can drive intelligent workflows, faster and smarter decision-making, and real-time response to market requirements. Digital transformation takes a customer-driven, digital-first approach to all aspects of a business, and ultimately, it changes customer expectations and creates new business opportunities. It is a continual adaptation to a constantly changing environment, and its goal is to build a technical and operational foundation to evolve and respond in the best

possible way at real time to unpredictable and ever-changing customer expectations, market conditions and local or global events. Asian Paints is a company that has leveraged digital transformation to become customer-centric and innovative. The company has created a compelling digital vision and driven appropriate synergies to build technology platforms that foster customer-focused innovation. By deploying different technologies, Asian Paints has eliminated routine activities across the entire range of activities at its manufacturing facilities. The company's digital strategy has enabled it to transform itself into a click-and-mortar business, providing a wide range of customer focused solutions.

The current article details the experience of Asian Paints on its digital journey through which it attained a leading position in the paints market. The case depicts the history of innovations practiced in the company from the 2000s. It delves into the company's transformation into the services phase and describes the revamping and rebranding of its product portfolio. All content has been derived from secondary sources.

Keywords: Case study; Digital Transformation; Enterprise Systems; SAP HANA; Customer Centricity; Customer-focused innovation; real-time decision making;

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1. INTRODUCTION

Asian Paints (AP) was born as Asian Oil and Paint Company in 1942 when four friends came together in Mumbai to start a venture in response to India banning the import of oils amid World War 2. Today it is valued at around $36 billion drawing revenues of $4.4 billion with a PAT of $510 million. Apart from paints, the company has diversified into many other offerings. Its products now include Wall coverings, Textures Painting Aid, Adhesives,

Modular Kitchens and many more. Additionally, it provides services like waterproofing solutions, interior design services, safe painting services, etc.

The Indian paint business began over a century ago in 1902 when Shalimar Paints opened a plant in Calcutta (now known as Kolkata). Small producers and two foreign businesses made up the sector prior to World War II. Due to the cessation of imports following the war, local business owners established manufacturing facilities. Nevertheless, the market was still dominated by international businesses. ICI, British Paints (now Berger Paints), Goodlass Walls (now Goodlass Nerolac), Jenson & Nicholson, Blundell & Eomite, and British Paints initially controlled the market. In India, there are currently twelve companies involved in the organized paint and coatings market, while over 2,000 are involved in the unorganized market. The leading companies in this sector include Shalimar, Asian Paints, Goodlass Nerolac, Berger, and ICI. (Samaddar, 2021).

The paint industry has always been a commoditized one. Businesses cannot, therefore, charge significantly more than their rivals. The product lacks anything distinctive to set it apart. The production methods are similar, chemical compositions remain constant, and there is minimal disturbance in operations. However, Asian Paints used technology to transform this dull, commodity-based sector into something far more fascinating, and they went on to dominate the market.

The digital transformation at Asian Paint has resulted in operational excellence, enhanced customer experience, and reinvention of the business model. Asian Paints is considered a digital master because it has not only built digital capabilities over the years but also deployed leadership capabilities to transform itself into a digitally empowered solutions company (Westerman et al., 2014). This chapter discusses how Asian Paints progressed with the adoption of various digital technologies in becoming a pioneering digital firm.

2. OPERATIONAL EXCELLENCE

Until 1969, the standard route to selling paints was:
Company → Distributors/Wholesalers → Retailer → Customer

Asian Paints tried to shake things up in 1969 when they decided to remove the distributors and wholesalers from this chain. They wanted to sell directly to the retailers to improve their margins. They also offered higher margins to the retailers. However, retailers were not willing to adopt this change, as it required them to invest more capital and arrange higher storage areas to maintain the inventory. Asian Paints tackled this problem by committing to stocking the retailers every three hours! With 40,000 dealers, it would mean they have to stock up 1.6 lakh times a day across the country. They were able to achieve this only due to the power of data.

Asian Paints holds the distinction of having the first supercomputer in India. In 1970, it invested Rs. 8 crores to buy a supercomputer (Aswin, 2023). With the insights on customer buying behaviour based on past data, the system could zero in on not just the colours being demanded but also can sizes, paint base types, and quantity of the colours. Every customer purchase added to their pool of data, which further enhanced the predictions. It not only helped handle the 1.6 lakh stock-ups every day but also later helped plan for pre-distribution processes like procurement of raw materials and the production process itself.

Later in the year 2000, ERP implementation provided the operational backbone that helped further digital transformation. It first helped standardize the process of taking orders from retailers.

Hundreds of salespeople from Asian Paints' workforce routinely visited thousands of merchants to schedule purchases. In addition to placing orders, they responded to inquiries and arranged for each order to be delivered via local distribution centers. These local distribution centers, which mostly operated independently of one another, subsequently fulfilled the orders. Leveraging ERP systems, Asian Paints could construct a sophisticated supply chain management system and an end-to-end order-to-cash procedure.

After initial success with ERP, the company executives soon found an opportunity to improve customer experience and sales performance. They envisioned setting up a call centre to serve the routine tasks of taking orders instead of having so many salespeople do it on the field. This resulted in saving time and bringing economies of scale in order-taking personnel. The centralized call centre standardized the order-taking process and in turn, standardized the customer experience. Earlier, customer experience largely depended on the salesperson servicing the customer and it differed across geographies. Also, executives now had a single view of all customer-related activity in the company. They could also see the order-fulfilling performance of individual distribution centres.

This change did not eliminate the role of salespeople, but had their roles changed. Basis unified data and a strong call centre, the company provided its salespeople with mobile phones with access to up-to-date sales and order information. This greatly helped them grow their relationship with their retailers. The company also started delivering directly to customer work sites instead of retailers in some cases which again was made possible due to a strong IT foundation in place.

SAP HANA was first used by Asian Paints in December 2011. It put into practice a side-car strategy to push billing data from SAP ECC to HANA for an immediate analysis. This contributed in giving the sales team useful information for handling trade promotions. The company then moved to CRM on HANA to handle client interactions via online and voice channels, after migrating the SAP BW system to HANA runtime. The organization moved from SAP ECC to Suite on HANA in August 2014.

Asian Paints implemented the new COPA and the Simple Finance on Suite on HANA in 2015. For the Simple Finance Conversation, it became a pilot customer for the NZDT tool. In 2018, it completed the adoption of S/4 HANA (Simple Logistics as well as Simple Finance). This on-premise installation was among the earliest S/4 HANA deployments in India's manufacturing sector. Asian Paints was able to reduce its database requirements by 60% with the use

of this technology. The company then launched a worldwide template for their international business unit to adopt S/4 HANA, and in less than 14 months, they were able to accomplish this across all 11 of their international business units.

Since then, a significant portion of the enterprise and applications - including advanced analytics - have relied on SAP HANA. The SAP HANA setup has emerged as the digital core of the organization - the single technology platform for both transactional and analytical workloads for real-time data processing. This has greatly helped fields like sales and trade promotion, where real-time data is essential for maximizing business effect and enhancing decision-making. (Writer, 2021).

On another front, Asian Paints invested in Manufacturing Analytics to develop a single view for effective decision-making on the shop floor despite disparate data sources. Asian Paints has 26 factories across the country that generate thousands of logs and reports every day regarding operations, inventory, and more. Data is being generated by various transactional systems in the factories. Due to disparate sources, there was no single view of all this information within a factory. Every month, the corporate office used to download reports in Excel format from the several transactional systems for each of the numerous production sites. Depending on the type of information the managers are requesting, this could take quite a while. Thus, a need was felt by leadership to get this information into a unified source (integration) for convenient access by managers and to aid faster decision-making.

To address this problem, a dashboard was created using SAS Visual Analytics which acted as a common view for all reports getting generated at the plant. The dashboard also handles data cleaning and advanced analytics to provide management insights. The solution has various complex data manipulation and business logic built in and comes with an appealing interface. Thus, analysts can focus on getting actionable insights instead of spending time validating data against their business scenarios.

The company also deployed the Robotic Process Automation (RPA) along with OCR technology to automate invoice processing. This technology can read invoice details digitally and approve/disapprove the invoice based on a pre-trained Machine Learning (ML) model. With each new invoice, the model gets better at its prediction. The model currently operates at a high efficiency which is further being improved by the efforts of the in-house technology unit of Asian Paints as well as an external vendor. As reported in the Annual Report, in FY 21-22, 89% of invoices were processed digitally of which 64% were processed in a truly touchless manner. The differential refers to some transactions which currently require an additional layer of scrutiny for certain parameters. The model also takes care of government laws and regulations.

A further technological tool utilized to attain operational excellence was the digital twin made possible by Sight Machine's solution. Asian Paints' Chennai plant used Sight Machine's manufacturing data platform to turn plant data into a digital twin of the complete production process. The automated solution gathered and contextualized data from hundreds of machines and many sources. Within 60 days of implementation, it succeeded in reducing batch cycle time by 7% and identified more than 100 strategies to increase productivity.

3. ENHANCING CUSTOMER EXPERIENCE

Asian Paints undertook a number of initiatives as part of its digital transformation to enhance the customer experience through the use of digital technologies. For instance, Asian Paints has created a smartphone application called "Wal," which functions as a virtual room painter tool and lets users see how various paint colors and textures will seem in their homes. Digital technologies like computer vision, image processing, and 3D rendering were combined to create the tool. Asian Paints has partnered with Snapdeal to provide this service to clients.

The inability of customers to visualize a paint color or texture in their homes before making a purchase was solved by this digital solution. Consumers could now take pictures of their rooms using the Wal App, then change the wall textures and paint colors of their room from within the app. Customers

can take advantage of this to get an idea of how the paint will look in their rooms before making the final purchase. The application also has capabilities to add furniture and alter the lighting inside the rooms (on the app) so as to improve the realistic nature of the portrayal. The various surfaces and items inside the customer's rooms, including the walls, doors, and furniture, can be recognized within the app using computer vision technology. Then, based on the customer's selections, various paint colors and textures are applied to the surfaces in real-time, again utilizing image processing technology. To help consumers visualize how the paint might look in their home, 3D rendering technology provides a realistic depiction of the room with lighting and shadows.

Asian Paints has seen a rise in revenue thanks to this application, which has also decreased product returns and associated resource wastage. Customers are more satisfied with the finished product and return fewer items, because of the application, which lets them see how a paint color or texture would look like in their own environments, before making a purchase. Asian Paints' sales (especially online sales) have increased as a result of the application. Asian Paints can reach a wider audience and boost its online sales thanks to its agreement with Snapdeal. Additionally, it gives Asian Paints insightful data about its customers. By examining data from uploaded photos and paint selections, Asian Paints can discover consumer choice patterns and purchase inclinations. Subsequent efforts in product development and marketing can then be guided by this data. Through the elimination of the need for in-person paint samples and store visits, the application has allowed Asian Paints to stand out from rivals while cutting operating expenses.

Asian Paints has developed a strong presence on the popular social media platforms. They use Facebook, Instagram, and YouTube, amongst others, to engage with their customers and promote their products. In addition to building and maintaining the company's social media accounts, this entails producing and disseminating a wide range of content, including product photos and videos, client endorsements, and instructional articles about interior design and home renovation. Asian Paints wants to interact with

consumers and use social media campaigns to sell their products, so they're stepping up their presence on sites like Facebook, Instagram, and YouTube. Additionally, their collaboration with Facebook enables them to reach a wider audience and raise brand awareness more effectively, since it is able to focus on specific demographics and execute more successful campaigns on that platform. Being in the forefront of potential customers' minds and remaining relevant is the ultimate goal of this strategy, which aims to boost sales and revenue.

Asian Paints makes use of social media management tools to control its online presence across various social media channels. These systems give them the tools they need to monitor statistics, plan and produce pieces, and interact with readers. It organizes and publishes its material on many social media platforms using specialized content management systems. They can schedule, edit, and produce content using these platforms, and they can also monitor interaction and statistics. The analytics tools are employed to monitor the effectiveness of social media posts and campaigns. Asian Pains uses the data on engagement, reach, and conversions that these platforms give them to enhance their campaigns and raise their return on investment. Asian Paints also employs AI and machine learning to analyze the information they gather from social media posts in order to understand the preferences, demographics, and behavior of its customers. They will be able to target the proper audience, produce more pertinent content, and optimize their campaigns as a result. Lastly, Asian Paints employs influencer marketing to broaden the reach and awareness of its brand. They work together with celebrities and social media influencers to produce and market content across many channels.

In addition to interacting with users on social media, Asian Paints invited people to vote for the best user-submitted stories and submit their own home stories in a contest they started on their website. Prizes were given to the authors and uploaders of the top stories, as determined by the total number of votes. This method appealed not only to people who would like to share their

memories and experiences about their homes, but also to readers. The show did a great job of capturing the audience's interest.

4. REINVENTING BUSINESS MODEL

The digital transformation initiatives discussed so far, have contributed towards operational excellence and enhancement of customer experience. However, combined, they also reinvented the business model of Asian Paints over a period of time.

Asian Paints started as a paint company in a crowded commodity business where differentiation is difficult, if not impossible. But with the help of digital technologies, Asian Paints not only became a market leader, it has now transformed itself into a solutions company from a product company.

While the end product (paints) has not changed, an extra value is being added here by making the activity of selecting and buying paints a more involved and engaging one. In the case of paints, the end consumer is usually not the customer as it is the contractor who goes and purchases the paint. That's why traditionally there has been a disconnect with the end consumer, a gap that Asian Paints has started to fulfil by using apps and social media. These technological interventions give power to the consumer to choose the ideal paint for their needs and not solely rely on contractors.

Asian Paints has not only redesigned the current business model but also introduced Beautiful Homes, a new digital-first initiative. Beautiful Homes with Asian Paints is India's largest digital design content platform, boasting nearly a million followers and subscribers, according to its website. Furthermore, clients of Beautiful Homes Services (BHS) can choose to have their houses professionally designed by seasoned interior designers and professionally managed by expert project managers. The third component of the Beautiful Homes brand is Shop, which offers a wide range of goods from the lighting and furniture catalog from Asian Paints. With so much to choose from, BH Shop is an ideal online destination for Indian homeowners seeking excellent design and quality at an affordable price.

5. CONCLUSION

Asian Paints' evolution from its wartime inception to a $34 billion titan represents an inspiring saga of digital transformation. Its ascent is a testament to how digital technologies can not only transform a company but also impact an entire industry landscape.

Initially birthed amidst the upheaval of World War II, Asian Paints navigated the challenges of a commodity-based industry, where differentiation was limited. Yet, their pursuit of innovation—beginning with the audacious removal of intermediaries in the sales chain—marked the first steps towards reshaping the market. The pivotal investment in a supercomputer in the 1970s laid the foundation for data-driven decision-making, enabling real-time stock predictions and unprecedented customer insights.

The company's embrace of Enterprise Resource Planning (ERP) in 2000 propelled them further into operational efficiency, standardizing processes and streamlining supply chains. This marked a paradigm shift, empowering salespersons with mobile technology and centralized call centres, thereby revolutionizing customer engagement.

Asian Paints' commitment to digital transformation extended beyond operations. The creation of the Wal App, a virtual room painter, exemplified their dedication to enhancing customer experience. Through strategic partnerships and leveraging computer vision and 3D rendering technologies, they enabled customers to visualize paint colours and textures in their homes before purchase, reducing returns and bolstering online sales.

Asian Paints' foray into social media engagement, influencer marketing, and the creation of a community-driven platform, Beautiful Homes, underscored their pivot from a mere paint manufacturer to a comprehensive solutions provider. This digital-first business model, offering design content, professional services, and an expansive product catalogue, symbolizes their commitment to catering holistically to customers' needs.

In essence, Asian Paints' journey reflects the transformative power of digital initiatives. By combining technological innovation with a customer-centric approach, they not only revolutionized their business model but set a precedent for the industry—proving that in a world of commodities, it's the strategic application of technology that breeds unparalleled success and sustenance.

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