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Your “Idea” of today may become a “thought” of tomorrow. A “flash of truth” envisioned by you today may prove to be a “Law” of tomorrow, therefore let them not slip away into darkness, show them the light of the day; get them published.

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Narratives that build or break trust: a structural model of sustainable storytelling, greenwashing and brand loyalty

Dr. Preeti Malik

ABSTRACT

The growing emphasis on sustainability has redefined branding strategies, with organizations increasingly employing storytelling to communicate environmental and social commitments. This study investigates the impact of sustainable storytelling on consumer engagement, trust, and brand loyalty through a Structural Equation Modeling (SEM) approach. Primary data were collected from 210 corporate employees across Delhi NCR, supplemented by secondary insights from global sustainability practices.

The findings reveal that sustainable storytelling significantly enhances consumer engagement and trust, which in turn drive brand loyalty. Transparency emerges as a critical determinant of trust, while greenwashing exerts a negative influence. The SEM results confirm strong model fit and statistically significant relationships among constructs. The study contributes to the literature by integrating storytelling theory with sustainability and consumer behaviour in an emerging market context.

Keywords: Sustainable storytelling, Consumer engagement, Brand trust, Green marketing, SEM, Corporate responsibility

INTRODUCTION

Sustainability has evolved from a peripheral

concern into a central strategic imperative for organizations worldwide. With rising environmental awareness and stakeholder activism, brands are under increasing pressure to demonstrate authentic commitments to sustainability. In this context, storytelling has emerged as a powerful mechanism to communicate corporate values and initiatives.

Sustainable storytelling refers to the deliberate use of narratives to convey a firm's environmental and social responsibility efforts in a manner that resonates with stakeholders. Leading organizations such as Patagonia and Unilever have successfully leveraged storytelling to build trust and differentiation. Conversely, controversies involving Volkswagen illustrate the reputational risks associated with misleading claims.

Despite growing global research, limited empirical evidence exists in the Indian context, particularly among corporate consumers in metropolitan regions such as Delhi NCR. This study addresses this gap by employing a data-driven SEM approach.

LITERATURE REVIEW

Sustainable Branding and Marketing

Sustainable branding involves the integration of environmental and social considerations into the core strategic framework of an organization. It extends beyond compliance to create long-term

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value for both the firm and its stakeholders. Kotler and Keller (2016) argue that sustainability-oriented strategies enhance brand equity by strengthening differentiation and consumer trust. Similarly, Porter and Kramer (2011) emphasize the concept of shared value, wherein firms generate economic benefits while simultaneously addressing societal challenges. This dual focus positions sustainability as a source of competitive advantage rather than a cost.

Storytelling in Marketing

Storytelling has gained prominence as a powerful communication tool that enables brands to connect with consumers on both emotional and cognitive levels. Narrative-based communication enhances message processing and recall by embedding information within meaningful contexts (Escalas, 2004). Furthermore, storytelling facilitates the development of brand attachment and identity by allowing consumers to relate to the brand's values and purpose (Woodside, 2010). In the context of sustainability, storytelling helps translate complex environmental and social initiatives into relatable and impactful narratives.

Consumer Trust and Transparency

Trust is a central determinant of consumer decision-making and long-term brand relationships. Delgado-Ballester (2004) identifies trust as a key driver of brand loyalty, particularly in contexts involving uncertainty or ethical considerations. Transparency, in this regard, plays a crucial role in strengthening credibility and reducing consumer skepticism (Rawlins, 2008). Clear, consistent, and verifiable communication of sustainability practices enhances perceived authenticity and fosters confidence among stakeholders.

Greenwashing

Greenwashing refers to the practice of conveying a false or exaggerated impression of a company's environmental responsibility (Delmas & Burbano, 2011). Such practices create information asymmetry and mislead consumers, ultimately eroding trust and damaging brand reputation. High-profile cases involving H&M illustrate the risks associated with superficial sustainability claims, where discrepancies between communication and actual practices lead

to consumer backlash and regulatory scrutiny.

Research Gap

While the existing literature provides substantial insights into sustainable branding and consumer behaviour, it is predominantly centered on Western markets. There is a relative lack of empirical studies examining the effectiveness of sustainable storytelling within the Indian context, particularly among urban corporate consumers. Moreover, limited research employs advanced analytical techniques such as Structural Equation Modeling (SEM) to validate the relationships among storytelling, trust, engagement, and loyalty. This study seeks to address these gaps by providing a data-driven analysis within the Delhi NCR corporate ecosystem.

HYPOTHESES DEVELOPMENT

- H1: Sustainable storytelling positively influences consumer engagement
- H2: Transparency positively influences consumer trust
- H3: Consumer trust positively influences brand loyalty
- H4: Greenwashing negatively influences consumer trust
- H5: Consumer engagement mediates the relationship between sustainable storytelling and brand loyalty

RESEARCH OBJECTIVES

- To examine the impact of sustainable storytelling on consumer engagement.
- To evaluate the influence of transparency on consumer trust in sustainability communication.
- To analyse the effect of consumer trust on brand loyalty.
- To assess the negative impact of greenwashing on consumer trust.

- To investigate the mediating role of consumer engagement in the relationship between sustainable storytelling and brand loyalty.

RESEARCH METHODOLOGY

Research Design

The study adopts a descriptive and causal research design to examine the relationships among sustainable storytelling, consumer engagement, trust, and brand loyalty. Structural Equation Modeling (SEM) is employed to test the proposed conceptual framework and hypotheses.

Data Collection

The research is based on both primary and secondary data sources:

- Primary Data:** Collected through a structured questionnaire using a Likert scale to capture respondents' perceptions.
- Secondary Data:** Sourced from academic journals, industry reports, and relevant case studies to support theoretical development.

Sample Design

The study includes a sample of 210 respondents drawn from corporate offices in the Delhi NCR region. A convenience sampling technique is used due to accessibility and time constraints.

Measurement Scale

All constructs are measured using a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), ensuring consistency and ease of response.

Analytical Tools

Data analysis is conducted using the following statistical tools:

- SPSS:** For exploratory factor analysis (EFA) and reliability testing (Cronbach's alpha)
- AMOS:** For confirmatory factor analysis (CFA) and Structural Equation Modeling (SEM) to validate the measurement and structural models.

DATA ANALYSIS

Reliability Analysis

Construct	Cronbach's Alpha
Storytelling	0.86
Transparency	0.88
Engagement	0.84
Trust	0.89
Loyalty	0.87

Factor Analysis

KMO = 0.891

Bartlett's Test ($p < 0.001$)

Total variance explained = 72.5%

Confirmatory Factor Analysis (CFA)

Construct	CR	AVE
SS	0.89	0.62
TR	0.90	0.69
CE	0.87	0.63
CT	0.91	0.67
BL	0.88	0.65

Model Fit Indices

Index	Value
CFI	0.94
TLI	0.93
RMSEA	0.058

Structural Model Results

Path	B	Result
SS → CE	0.67	Supported
TR → CT	0.72	Supported
CT → BL	0.75	Supported
GW → CT	-0.61	Supported

DISCUSSION

The findings confirm that sustainable storytelling significantly enhances consumer engagement and trust, reinforcing its strategic importance in contemporary branding. Transparency emerges as

a critical enabler that strengthens credibility and fosters positive consumer perceptions, whereas greenwashing substantially undermines trust and damages brand reputation. These results suggest that consumers are increasingly discerning and responsive to the authenticity of sustainability communication.

The outcomes of the study are consistent with established theoretical frameworks. In line with *Signaling Theory* (Spence, 1973), credible and verifiable sustainability disclosures function as positive signals that reduce information asymmetry and enhance consumer confidence. Similarly, *Stakeholder Theory* (Freeman, 1984) is supported, as organizations that align their sustainability narratives with stakeholder expectations are more likely to build enduring relationships and achieve long-term legitimacy.

IMPLICATIONS

Managerial Implications

• **Integration of Sustainability into Core Branding Strategy**

Organizations must transition from treating sustainability as a peripheral marketing theme to embedding it within the core value proposition and brand architecture. This requires aligning sustainability initiatives with corporate mission, product design, supply chain practices, and stakeholder engagement.

Firms such as Patagonia demonstrate that when sustainability is integrated at a strategic level, it enhances brand authenticity, differentiation, and long-term equity. Managers should therefore:

- Incorporate sustainability narratives across all touchpoints (advertising, packaging, digital platforms)
- Align internal practices (e.g., sourcing, production) with external communication
- Develop longitudinal storytelling, showcasing progress rather than one-time campaigns.

A fragmented or campaign-based approach risks being perceived as symbolic rather than substantive.

• **Ensuring Authenticity and Data-Backed Communication**

The study highlights that consumer trust is strongly influenced by verifiable and evidence-based claims. Managers must move beyond vague sustainability messaging and adopt quantifiable, transparent communication frameworks.

For instance, Unilever provides measurable sustainability targets and periodic progress reports, strengthening credibility.

Main managerial actions include:

- Use of metrics and KPIs (e.g., carbon footprint reduction, waste minimization)
- Third-party certifications and audits (e.g., ESG ratings, sustainability indices)
- Disclosure of both achievements and limitations to avoid over-claiming

Authenticity is not merely ethical- it is a strategic asset that directly influences engagement, trust, and loyalty.

• **Strategic Risk Management: Avoiding Greenwashing**

The findings underscore that greenwashing has a significant negative impact on trust and brand perception. Cases such as Volkswagen illustrate how misleading claims can lead to reputational damage, financial penalties, and long-term erosion of stakeholder confidence.

Managers should:

- Establish internal governance mechanisms for sustainability communication
- Ensure alignment between marketing teams and sustainability/CSR departments
- Conduct pre-publication validation of claims

Greenwashing is not only a reputational risk but also a strategic liability affecting brand equity and investor confidence.

• **Enhancing Consumer Engagement through Narrative Design**

Sustainable storytelling should be designed to foster emotional resonance and cognitive engagement. Rather than presenting sustainability as abstract data, brands should translate it into relatable narratives and consumer-centric value propositions.

Effective strategies include:

- Story-driven campaigns highlighting real impact (e.g., communities, environment)
- Interactive and digital storytelling formats (social media, immersive content)
- Personalization of sustainability messages for different consumer segments

This approach strengthens consumer-brand relationships and facilitates deeper engagement pathways.

Policy Implications

• **Regulation of Misleading Sustainability Claims**

There is an increasing need for regulatory oversight to curb greenwashing practices. Governments and regulatory bodies should establish clear guidelines for sustainability communication to ensure that claims are accurate, verifiable, and non-deceptive.

In the Indian context, frameworks may be strengthened under agencies such as Securities and Exchange Board of India to:

- Define standardized criteria for environmental claims
- Impose penalties for misleading disclosures
- Mandate third-party verification of

sustainability reports

Such regulation will enhance market transparency and protect consumer interests.

• **Standardization of ESG Disclosures**

The absence of uniform reporting standards often leads to inconsistencies in sustainability communication. Policymakers should promote standardized ESG disclosure frameworks to ensure comparability and reliability.

Globally accepted frameworks such as:

- Global Reporting Initiative
- Task Force on Climate-related Financial Disclosures

Can serve as benchmarks for Indian organizations.

Main policy measures include:

- Mandatory ESG reporting for large corporations
- Integration of ESG metrics into financial disclosures
- Encouragement of digital transparency platforms

Standardization will facilitate informed decision-making by consumers, investors, and stakeholders, thereby strengthening the sustainability ecosystem.

• **Promoting Ethical Marketing Practices**

Regulatory bodies should also encourage ethical marketing frameworks that align corporate communication with actual business practices. This includes:

- Developing codes of conduct for sustainability advertising
- Promoting industry-wide best practices
- Encouraging self-regulation alongside formal compliance

LIMITATIONS

- Regional focus (Delhi NCR): The study is confined to respondents from Delhi NCR, which may limit the generalizability of findings to other regions with different socio-economic or cultural contexts.
- Convenience sampling: The use of non-probability sampling may introduce selection bias, reducing the representativeness of the sample.
- Cross-sectional data: Data were collected at a single point in time, restricting the ability to capture changes in consumer perceptions or establish causal relationships over time.

FUTURE RESEARCH

- Longitudinal studies: Future research can track changes in consumer perceptions over time to better understand the long-term impact of sustainable storytelling on trust and loyalty.
- Cross-cultural comparisons: Comparative studies across different regions or countries can reveal how cultural factors influence responses to sustainability narratives.
- Digital storytelling analysis: Further research can examine the role of digital platforms (e.g., social media, interactive content) in shaping consumer engagement with sustainability communication.

CONCLUSION

Sustainable storytelling has emerged as a vital strategic instrument for contemporary organizations operating in an increasingly sustainability-conscious marketplace. The findings of this study highlight that authenticity, transparency, and meaningful consumer engagement are critical in building trust and fostering long-term brand loyalty. In particular, data-driven and verifiable communication significantly enhances credibility, while superficial or misleading sustainability claims

risk eroding consumer confidence. Therefore, organizations must move beyond symbolic gestures and integrate sustainability into their core strategies, ensuring that brand narratives are consistently aligned with actual practices. Such an approach not only strengthens stakeholder relationships but also contributes to sustained competitive advantage.

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Role of digital platforms in creating environmental awareness among generation z

Dr. Mona Mehta ¹ and Ms. Krishna Pradhanani ²

ABSTRACT

The growing environmental challenges faced globally have highlighted the need for effective environmental awareness, particularly among younger generations. As one of the most digitally engaged generations, Generation Z actively consumes, distributes, and shapes environmental narratives through online channel. This research examines how digital platforms contribute to building environmental awareness within the Generation. It also looks at how various digital platforms influence Generation Z on their level of environmental awareness, as well as to identify the problems faced in promoting environmental awareness through these platforms. The study follows a descriptive research design, using a literature review and primary data collected from Generation Z respondents through a structured questionnaire shared via Google Forms. The study will be conducted in Vadodara district of Gujarat. A total of 120 respondents will be selected using purposive sampling. Data were analysed using statistical tools such as frequency, percentage, mean, standard deviation, and correlation tests. The findings are expected to how digital platforms can be used more effectively to promote environmental awareness and to highlight key challenges such as misinformation, limited engagement, and content credibility among generation Z. Based on the findings, the study suggests practical steps to improve the use of media for environmental communication.

This research contributes to understanding how digital platforms can be used more effectively to promote environmental awareness and responsible behavior among Generation Z.

Key words: Environmental Awareness, Digital Platforms, Generation Z

INTRODUCTION

Environmental problems such as climate change, loss of biodiversity, and ecological imbalance have intensified due to rapid urban development and human activities (Rockstrom et al., 2009). These issues have increased the urgency for creating awareness among people, especially younger generations, so that sustainable practices can be encouraged (Rockstrom et al., 2009). The 2021 Climate change reports have emphasized on the need of public awareness and action because of the environmental degradation caused by the various climatic changes. According to Arshad et al., (2020) Environmental awareness refers to an individual's understanding of environmental issues along with their willingness to adopt responsible behaviours for environmental protection. People who are well-informed tend to develop positive attitudes toward sustainability and are more likely to adopt eco-friendly practices. With the advancement of technology, digital platforms have emerged as powerful tools for communication and information sharing. (Harvard Business School Online, 2024).

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Theme: Information Technology (IT) and Computer Science for Development

Sub-theme: Cyber Security and Digital Equity

Digital platforms are defined as technology-based systems that allow people from diverse geographical locations of the world to connect, communicate, and share information online.⁵ These platforms make it possible for users across different locations to connect with each other, share ideas, and exchange information without any delay. The use of digital platforms has expanded rapidly and has brought a big transformation in the field of environmental communication and has enable timely sustainability related information across different countries. These platforms have been found to strengthen the public engagement and awareness (Kalpan & Haenlein, 2010). For today's youth, especially Generation Z, digital platforms serve as a primary source of information and engagement. According to Anderson, (2017) social media and digital platforms have been shown to positively influence climate change awareness. Thus, increasing knowledge and encouraging more discussions for climate change. Known as "digital natives", Generation Z depends on heavily on online platforms for learning, communication, and social interaction. Their preference for visual and interactive content, such as videos and social media posts, makes digital platforms highly effective in delivering environmental messages (Jayatissa, 2023). Various other studies have indicated that the Generation Z are concerned about environmental sustainability and climate changes compared to the previous generations. They are highly impacted by the digital platforms which encourages community involvement for environmental concerns. Various researches suggests that virtual and digital communications get significantly influenced by the environmental knowledge and public intentions. Visual storytelling, multimedia content, and online campaigns have been found to enhance understanding and encourage participation in environmental issues (O'Neill and Smith, 2014). Lee et al. (2020) stated that more studies indicate that exposure to environmental content through digital media can positively influence awareness levels and shape attitudes toward sustainability. The findings suggested that digital platforms helped in shaping the perceptions and attitudes towards environmental sustainability. In addition to this, digital platforms offer a low-cost and easily

expandable way to run awareness campaigns and engage communities on environmental problems. However, despite the widespread availability of environmental content online, challenges such as misinformation, lack of engagement, and credibility issues still exist. Therefore, it is necessary to examine the role of digital platforms in creating environmental awareness among Generation Z. It aims to understand how digital platforms influences environmental awareness, attitudes and perceptions.

OBJECTIVES OF THE STUDY

- 1) To assess the level of awareness of the generation Z regarding the use of digital platforms in creating environmental awareness.
- 2) To study the influence of digital platforms on the level of environmental awareness among the generation Z.
- 3) To identify the problems faced by the generation Z in promoting environmental awareness through digital platforms.
- 4) To suggest suitable strategies and recommendations for improving the effectiveness of media in creating environmental awareness.

REVIEW OF LITERATURE

The review of literature revealed that existing studies show how digital platforms shape the attitudes of the younger generations and highlight why environmental awareness is important for sustainable living. Digital platforms are online spaces that allow users across different geographical regions to communicate, interact, and exchange information freely (Harvard Business School Online, 2024). Rockstrom et al. (2009) emphasized on the necessity of better public understanding and engagement for the increasing environmental issues. Awareness plays a crucial role in shaping individuals' attitudes and encouraging environmentally responsible behaviour (Arshad et al., 2020). Research also suggests that social media

platforms enhance public engagement by making environmental information more accessible and relatable (Anderson, 2017). Kaplan and Haenlein (2010) stated that digital platforms enable communication and timely information. In particular, visual content such as images, videos, and storytelling techniques has been found to make environmental issues easier to understand and more impactful (O'Neil and Smith, 2014). Lee et al. (2020) revealed that exposure to environmental information through digital media can significantly improve knowledge levels and foster positive attitudes toward sustainability. Most of the studies focused on social media usage or environmental behaviours, without assess the combined effect of both. This indicates a gap in the existing literature, which the present study aims to address. To bridge the gap between online environmental content and influence of it on the Generation Z, this study was undertaken.

METHODOLOGY

This study used a descriptive research design and was conducted in the Vadodara city of Gujarat (Creswell, 2014). The inquiry unit for the present study were the people born between the years of 1997 and 2012, i.e., Generation Z. A total of 120 participants were chosen through purposive sampling. Only those individuals who identified as Generation Z and fell within the age range of 18 to 29 years were considered eligible for inclusion. The primary instrument for data collection was a structured questionnaire developed specifically for this study. A Three-point scale was constructed to measure the awareness of respondents, with response options of "Aware", "Undecided" and "Unaware", with scores ascribed from 3 to 1 respectively, about the role of digital platforms in creating environmental

awareness. A five-point scale was constructed to measure the influence of digital platforms on the level of environmental awareness, with the response options of "Strongly Agree", "Agree", "Neutral", "Disagree" and "Strongly Disagree", with scores ascribed from 5 to 1 respectively (Likert, 1932). The problems faced by Generation Z in promoting environmental awareness were measured through a three-point scale with options of "Always", "Sometimes" and "Never", with scores ascribed from 3 to 1 respectively. Each scale underwent validation procedures and the corresponding reliability coefficients were computed. Questionnaire was shared to respondents by using Google form, and they were informed that all information provided by them would remain confidential. All collected data was systematically organised and documented. Statistical techniques including frequency counts, percentages, weighted mean, and hypothesis testing were employed for analysis (Best & Kahn, 2006). The collected data was organised under four broad categories — background profile of participants, respondents' awareness regarding digital platforms and environmental awareness, the degree of influence exerted by digital platforms, and the difficulties encountered by Generation Z while promoting environmental awareness.

FINDINGS AND CONCLUSIONS

5.1 DEMOGRAPHIC INFORMATION OF THE RESPONDENTS

This section presents the demographic background of the participants, covering age, education, occupational status, average daily internet usage, and primary digital device used.

Z			
Sr.No.	Variable	Frequency	Percentage
Gender		F	%
1.	Male	63	52.50
2.	Female	57	47.50
Total		120	100.00
Age		F	%
1.	18 - 21 years	29	24.17

2.	22 - 25 years	54	45.00
3.	26 – 29 years	37	30.83
Total		120	100.00
Education Specialisation		F	%
1.	Primary Education	0	0.00
2.	Secondary Education	0	0.00
3.	Graduate	69	57.50
4.	Post Graduate	51	42.50
5.	Any Other	0	0.00
Total		120	100.00
Occupational Status		F	%
1.	Service	32	26.67
2.	Business	29	24.17
3.	Self Employed	26	21.67
4.	Unemployed	33	27.50
Total		120	100.00
Average daily internet usage		F	%
1.	Less than 1 Hour	8	6.67
2.	2-4 Hours	44	36.67
3.	4-6 Hours	41	34.17
4.	More than 6 Hours	27	22.50
Total		120	100.00
Primary digital device used		F	%
1.	Smartphone	80	66.67
2.	Laptop	9	7.50
3.	Tablet	1	0.83
4.	Multiple Devices	30	25.00
Total		120	100.00

The data recorded in Table 1 shows that in terms of gender, just over half of the total respondents (52.50 per cent) were male, while the remaining 47.50 per cent were female. With regard to age, the largest group of respondents (45.00 per cent) belonged to the 22 to 25 years age bracket. In terms of educational background, more than half of the respondents (57.50 per cent) held a graduate degree, and the highest share of respondents by occupation (27.50 per cent) were unemployed. When it came to daily internet usage, 36.67 per cent of the respondents reported spending 2 to 4 hours online on an average day. As far as the primary digital device is concerned, smartphones

were the most widely used device, with nearly two thirds of the respondents (66.67 per cent) relying on them as their main mode of accessing digital platforms.

5.2 AWARENESS OF RESPONDENTS ABOUT THE ROLE OF DIGITAL PLATFORMS IN CREATING ENVIRONMENTAL AWARENESS

This section presents the data findings concerning how aware the respondents were about the part that digital platforms play in building environmental awareness.

Table 2: Level of Awareness of Respondents About the Role of Digital Platforms in Creating Environmental Awareness.

Level of Awareness	Range of Score	F	%
Low Level of Awareness	20 - 33	0	0.00%
Moderate Level of Awareness	34 - 46	8	6.67%
High Level of Awareness	47 - 60	112	93.33%

The data presented in Table 2 indicates that respondents demonstrated a high overall level of awareness about the role of digital platforms to create environmental awareness. Not a single respondent was found to fall within the low awareness range (score range 20-33), which clearly shows that inadequate awareness about the role of digital platforms in environmental awareness was entirely absent among the sample. Among the total sample, only 8 respondents recorded a moderate level of awareness with scores falling between 34 and 46, which accounts for a small proportion of 6.67 per cent of the total participants. Whereas, a dominant majority comprising 112 respondents, which is 93.33 per cent of the total sample, recorded a high level of awareness with their scores falling in the

range of 47 to 60. The overall results point out that the respondents possess a considerably strong level of awareness regarding the role that digital platforms play in creating environmental awareness, and this can largely be attributed to the fact that the respondents are frequent and regular users of digital platforms.

5.3 INFLUENCE OF DIGITAL PLATFORMS ON THE LEVEL OF ENVIRONMENTAL AWARENESS

This section covers the data findings that relate to the degree to which digital platforms have an influence on the level of environmental awareness among the respondents.

Table 3: Extent of Influence of Digital Platforms on the Level of Environmental Awareness

Extent of Influence	Range of Score	F	%
Low Extent of Influence	20 - 33	4	3.33%
Moderate Extent of Influence	34 - 46	7	5.83%
High Extent of Influence	47 - 60	109	90.83%

The interpretation of data from table 3 regarding the extent of digital platform influence on environmental awareness suggests that digital platforms exercise a high degree of influence on the respondents. A very limited number of respondents, specifically 4 in total which represents just 3.33 per cent of the sample, were found to fall within the low extent of influence category with scores between 20 and 33, suggesting that very few respondents felt that digital platforms had little or no effect on their environmental awareness. Seven respondents from the total

sample were found to fall in the moderate extent of influence range with scores between 34 and 46, and these respondents together make up 5.83 per cent of the overall sample size. In contrast, a large and dominant majority of 109 respondents, accounting for 90.83 per cent of the total sample, reported experiencing a high extent of influence from digital platforms, with their scores ranging between 47 and 60. Based on the overall results, it can be clearly stated that the influence of digital platforms on the environmental awareness levels of the respondents is considerably strong.

5.4 PROBLEMS FACED BY GENERATION Z IN PROMOTING ENVIRONMENTAL AWARENESS

This section presents the findings related to the level of problems faced by Generation Z while promoting environmental awareness through digital platforms.

A review of the data presented in Table 4 makes it clear that Generation Z respondents experience a significant level of challenges when it comes to promoting environmental awareness through digital platforms. Only 1 respondent from the entire sample, representing a mere 0.83 per cent of the total, was found to fall in the low level of problems category with scores between 20 and

Table 4: Extent of Influence of Problems Faced by Generation Z in Promoting Environmental Awareness

Extent of Problems Faced	Range of Score	F	%
Low Extent of Problems	20 - 33	1	0.83%
Moderate Extent of Problems	34 - 46	11	9.17%
High Extent of Problems	47 -60	108	90.00%

33. A moderate level of difficulties with scores ranging from 34 to 46 was observed among 11 respondents, who together account for 9.17 per cent of the overall sample. On the other hand, an overwhelming majority of 108 respondents, making up 90.00 per cent of the total sample, reported facing a high level of problems with their scores falling between 47 and 60. These findings clearly bring out the fact that in spite of having a strong level of awareness and being greatly influenced by digital platforms, the respondents still continue to encounter a considerably high degree of difficulties in effectively promoting environmental awareness.

5.5 TESTING OF HYPOTHESES

Statistical tests including the t-test, Pearson correlation coefficient, and one-way ANOVA were applied based on the nature of each variable. All hypotheses were framed as null hypotheses and the outcomes are presented below.

HO1 : There is no difference in the level of awareness of Generation Z regarding the use of digital platforms in creating environmental awareness with the personal variables of respondents (age and gender).

Table 5: Analysis of Variance showing difference in the level of awareness of Generation Z regarding the use of digital platforms in creating environmental awareness with the personal variables of respondents - Age

Personal variables of respondents (Age)					
Selected variables	Sum of squares	Mean Squares	DF	F - Value	Level of Significance
Age					
Between groups	32.57761	16.289	2	0.55	N.S*
Within groups	3463.014	29.598	117		
Note: df = Degree of Freedom, * No Significance					

One-way Analysis of Variance was applied to examine this hypothesis. As reflected in Table 5, the F values obtained did not attain statistical significance with respect to differences in awareness levels across age groups. Accordingly,

the null hypothesis was retained, indicating that age does not meaningfully differentiate Generation Z respondents in terms of their awareness about digital platforms and environmental awareness.

Table 6: t-test showing the difference in the level of awareness of Generation Z regarding the use of digital platforms in creating environmental awareness with the personal variables of respondents - Gender

Selected variables	Mean Score	t - value	DF	Level of Significance
Male	56.460	-0.114	116	N.S*
Female	56.578			
Note: df = Degree of Freedom, * No Significance				

The independent samples t-test results presented in Table 6 revealed that no statistically significant difference was observed between male and female Generation Z respondents in their awareness levels regarding digital platforms as a tool for environmental awareness. The null hypothesis was therefore retained, establishing that gender

does not act as a distinguishing variable in this context.

HO2 : There exists no variation in the influence of digital platforms among the Generation Z with the personal variables of respondents (age and gender).

Table 7: Analysis of Variance showing variation in the influence of digital platforms among the Generation Z with the personal variables of respondents - Age

Selected variables	Sum of squares	Mean squares	DF	F-Value	Level of Significance
Age					
Between groups	4.185593	2.0982	2	3.04	N.S*
Within groups	27978.62	237.107	118		
Note: df = Degree of Freedom, * No Significance					

One-way Analysis of Variance was applied to examine this hypothesis. As reflected in Table 7, the computed F values did not reach a statistically significant level for the variation in age group of respondents and the influence of digital platforms on their environmental awareness,

and therefore the null hypothesis was accepted, establishing that age group does not bring about any meaningful difference in the extent to which digital platforms shape environmental awareness among Generation Z.

Table 8: t-test showing variation in the influence of digital platforms among the Generation Z with the personal variables of respondents - Gender

Selected variables	Mean Score	t - value	DF	Level of Significance
Male	55.2698	-1.152	113	N.S*
Female	56.8421			
Note: df = Degree of Freedom, * No Significance				

The independent samples t-test results presented in Table 8 revealed that gender among Generation Z respondents yielded no statistically significant difference in their level of awareness regarding the use of digital platforms in creating environmental awareness. Thus, the null hypothesis was accepted, confirming that gender does not constitute a differentiating factor

in the level of environmental awareness fostered through digital platforms among Generation Z.

HO3 : There exists no relationship between the problems faced and the level of awareness of generation Z regarding the use of digital platforms in creating environmental awareness.

Table 9: Co-efficient of Correlation showing relationship between the problems faced and the awareness of Generation Z regarding the use of digital platforms in creating environmental awareness

Selected variables	n	r - value	Level of Significance
Problems faced by Generation Z in promoting environmental awareness	120	0.263	N.S*
Awareness of respondents about the role of digital platforms in creating environmental awareness			
Note: df = Degree of Freedom, * No Significance			

The findings from the analysis established the presence of a statistically significant relationship between the problems faced by Generation Z in promoting environmental awareness and their level of awareness regarding the role of digital platforms in creating environmental awareness at 0.05 level of significance. The null hypothesis

was therefore rejected, establishing that a real and statistically meaningful association exists between the two variables, as shown in Table 9.

HO4 : There exists no relationship between the problems faced and the extent of influence of digital platforms among the Generation Z.

Table 10: Co-efficient of Correlation showing relationship between the problems faced and the extent of influence of digital platforms among the Generation Z

Selected variables	n	r - value	Level of Significance
Problems faced by Generation Z in promoting environmental awareness	120	0.616	N.S*
Awareness of respondents about the role of digital platforms in creating environmental awareness			
Note: * Level of Significance			

The findings from the correlation analysis established the presence of a statistically significant relationship between the problems faced by Generation Z in promoting environmental awareness and the extent of influence of digital

platforms among Generation Z at the 0.05 level of significance. The null hypothesis was consequently rejected, affirming the presence of a significant and substantive connection between the two variables, as detailed in Table 10.

OUTCOMES OF THE STUDY

SUITABLE STRATEGIES AND RECOMMENDATIONS FOR IMPROVING THE EFFECTIVENESS OF MEDIA IN CREATING ENVIRONMENTAL AWARENESS

- Enhanced awareness through digital platforms – The study revealed that digital platforms play an important role in increasing environmental awareness among Generation Z because of their frequent use and so interactive formats (like reels, short videos and visual story telling) can be incorporated more for promotions of social campaigns.
- Community Based Campaigns – Community based campaigns can be promoted through digital platforms which will engage the society and communities as a whole, thus leading to more participation in initiatives like online challenges, campaigns, seminars, and webinars.
- Promotions through Influencers and Youth Ambassadors – The influencers and other popular personality have a great impact on the Generation Z, thus including them in promotions will enhance the reach and engagement of the online published content.

CONCLUSION

The findings of this study strongly highlight that digital platforms serve as a significant and impactful medium in building and promoting environmental awareness among the Generation Z population. An analysis of the weighted mean scores clearly reflects that smartphones and popular social media platforms such as Instagram function as the primary and most relied upon sources of environmental information for Generation Z individuals. The study further found that digital platforms carry a strong and positive influence on Generation Z, helping them develop a better understanding of environmental issues and motivating them to take the required steps toward addressing the existing problems related to environmental awareness. Also, based

on the results of hypothesis testing, it can be concluded that personal demographic variables such as age group and gender did not produce any statistically significant variation in either the level of awareness of Generation Z regarding the use of digital platforms in creating environmental awareness or the extent of influence of digital platforms among Generation Z respondents. The one-way Analysis of Variance and independent samples t-test consistently yielded non-significant results across both demographic variables, leading to the acceptance of the respective null hypotheses. Furthermore, the correlation analysis revealed a statistically significant moderate positive relationship between the problems faced by Generation Z in promoting environmental awareness and the extent of influence of digital platforms among Generation Z, confirming that a genuine and meaningful association exists between the two variables at the 0.05 level of significance, thereby leading to the rejection of the null hypothesis. Thus, it can be firmly stated that digital platforms stand out as a highly effective and widely accessible medium for spreading and promoting environmental awareness, and this effectiveness is particularly evident and pronounced in the case of Generation Z.

IMPLICATION OF THE STUDY

- By researching about the role of digital platforms in creating environmental awareness among the generation Z, the study will contribute to the existing literature by bridging the gap between digital platforms and environmental awareness.
- For Generation Z, it serves as a guide and will help in better understanding for how young individuals can perceive and engage with environmental content, thus promoting sustainable lifestyle practices.
- For environmental enthusiasts and organizations working for environment, it offers a comprehensive understanding and the results can be taken into considerations for building up strategies for environmental awareness campaigns.

RECOMMENDATION FOR THE FUTURE STUDY

- Future research could extend this work by carrying out comparative studies across different geographical regions to better understand how location affects digital platform influence on environmental awareness.
- It is further recommended that long term behavioural changes resulting from digital platforms awareness campaigns can also be tested.

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Cybersecurity Threats and Defense: Ransomware, Zero Trust, and Dark Web Intelligence

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ABSTRACT

The innovative and speedy growth of digital technologies has pretty much changed the world, and at the same time, it has caused scary security problems. Ransomware attacks, utilizing the dark web for intelligence, and adopting Zero Trust models are some of the most significant cybersecurity threats at present. The paper combines outcomes from theoretical and practical researchers to explain the interaction of these three spheres in an ever-changing scenario with quickly updated data. First of all, the paper, based on the latest research articles, changes the focus of ransomware to the transformation of the defensive paradigm through the Zero Trust framework and the future of the dark web as a source of cyber threat intelligence to help in the prediction and prevention of attacks. The research is then carried out to understand the interrelation of these three areas in the rapidly changing data environment. The final section of the research deals with the idea that, in order to be able to carry out a successful cybersecurity plan in such a turbulent environment, an organization should adopt a multi-layered strategy involving human judgment, AI, and strong policy frameworks. However, the ethical, operational, and analytical challenges of this ecosystem, which require proper handling and cooperation at the global level, are put forward alongside the new technological tools for early detection and protection.

Keywords: Cybersecurity, Ransomware, Operational and Analytical Challenge

INTRODUCTION

Just like how the world has been merging into one big village, online threats have also become more sophisticated. Every digital innovation—from cloud computing to artificial intelligence still has a sophisticated attempt to exploit it. Therefore, cybersecurity is no longer a handful of specialist's issue, but rather, the fourth vital pillar of the modern world after democracy, market economy, and rule of law. [1][2][3]

In the frightening scenario, ransomware attacks have been the main instruments and have constituted the most frequent and the most severely damaging threats to cyber security. Such attacks have been the cause of the biggest increase in the criminal industry in terms of revenue and, thus, are the primary reasons for the terror of hospitals, governments, and corporations. These are the ones to which these entities have been turning. [1][4][5]

Nevertheless, the cybersecurity strategy is not just a few additional physical security measures anymore; it has been completely changed to sophisticated, agile, and data-driven models. Zero Trust is a concept that does not even depend on a user or a device that is already verified, therefore, it means a radical change in the way companies think and implement security. [3][6][7]

In addition to that, companies are gradually transitioning to a blueprint that involves the use of threat intelligence sourced from the dark web - extremely secure online platforms and

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marketplaces where threat actors trade tools, data, and methods - to their security infrastructures. Those organizations that gather and analyze such information can be a predictive insight of the next cyberattacks long before they occur. [2][8][9][10]

This study looks into understanding how ransomware, Zero Trust, and dark web intelligence are interconnected with each other and work flawlessly in shaping the current cybersecurity landscape. Synthesizing the recent studies, this paper identifies the new patterns, innovates defenses, and discusses the practical and moral issues of working in a continuously updated, high-volume data environment. [1][2][3][6][9]

Cybersecurity academic and industrial research has been flourishing rapidly in the last few years. The first of the three key points outlined in this paper correspond to the changes in ransomware, describing it as a technological and economic phenomena. The next point features the impact of Zero Trust architectures on the defensive side of the security equation. The final point refers to the use of data from the dark web for the enhancement of predictive and preventive cybersecurity capabilities. [1][3][4][5][6][7][8][9]

One of the critical changes in ransomware is its transition from the most basic methods of digital extortion to the creation of an intricate criminal ecosystem. The very first examples were the case of the 1989 AIDS Trojan, which were limited in design and consequences. However, in today's world, ransomware groups take advantage of highly secure encryption algorithms, use zero-day vulnerabilities, and practice crypto-transactions to maintain anonymity. The concept of "Ransomware-as-a-Service" has thus facilitated the process of industrialization of this terrorist act by which the affiliates can easily rent the means of marring and share the revenue with the developers. In other words, the cybercrime market has become more accessible to technology ill-skilled cyber-attackers and, consequently, their number of possible victims has increased significantly. [1][4][5]

On the other hand, the Zero Trust model is a revolutionary change in defensive strategies as it moves away from the idea of perimeter protection. The model assumes that every connection, request, or identity hostile in nature, hence verification is carried out in every case. Instead of operating within network boundaries, Zero Trust continuously authenticates and authorizes users and devices, taking into consideration the context, behavior, and compliance with the policy. The model's features correspond with those of the current-day enterprises where employees work from home, cloud services and third-party integrations are widely used and, as a result, the boundaries of the organizational control are no longer visible. Nevertheless, literature accentuates that conceptualization of Zero Trust as a product is erroneous and rather a process is to be understood, meaning it necessitates a careful implementation, strong identity management, and cultural change spread throughout the organization. [3][6][7][8][10]

The dark web is an encrypted part of the internet which can be accessed through various tools such as Tor and offers a unique potential for cyber threat intelligence (CTI). Research works, for instance by Paulo Shakarian and his team members, provide evidence on how dark web forums and marketplaces mining can facilitate the revelation of the earliest indicators of intended cyberattacks. The leaked credentials, the called for selling of exploits, or the hacker discussions can be verified by cross-referencing them with event logs along with threat feeds so that attack patterns can be detected. However, the initiative faces several ethical and technological challenges. Collecting data on the dark web is a risky and illegal operation, and since data gathering is mostly unstructured, it requires the use of advanced machine learning techniques that would help agents identify the relevant information. [2][8][9][10]

LITERATURE SURVEY

This research synthesizes the central concepts of the theme from the four different pieces of research and is a comparative paper. The four researches are: a detailed taxonomy of ransomware and a

survey of its defenses, an editorial on the dark web as a source of cyber threat intelligence, a paper on the revolutionary cybersecurity innovations, and a research study on data breaches and defensive strategies. By contrasting these sources, the paper obtains a more in-depth understanding of how cybersecurity threats and defenses change with the environment of a continuous data flow. Actually, the authors of these different works have different viewpoints but come to the same result - the paper on the ransomware attack on

the supply chain as the research giving the most considerable pieces of evidence that support the behavior of threats, the dark web research as the help in comprehending the prediction that is data-driven and Zero Trust frameworks as the direction of defense paradigm's change. In summary, they have built a comprehensive, multidimensional understanding of the present cybersecurity environment by combining all these ideas.

No.	Research Paper	Focus/Title	Summary	Main Contribution to This Study	Key Findings Integrated
1.	Oz, H., Aris, A., Levi, A., & Uluagac, A. S. (2022). <i>A Survey on Ransomware: Evolution, Taxonomy, and Defense Solutions</i>	Comprehensive review of ransomware evolution, classifications, and modern defense methods.	Helps to understand, with the aid of this paper, how ransomware has developed over the years starting from the initial attacks leading to the concept of industrialized Ransomware-as-a-Service.	Highlights how ransomware has become more complicated and professionalized, thereby, adaptive defense models being highly necessary.	Shows the need for continuous improvement in ransomware defenses through adaptive and layered models.
2.	Shakarian, P. (2018). <i>Dark-Web Cyber Threat Intelligence: From Data to Intelligence to Prediction</i>	Explores dark web intelligence gathering for predictive cybersecurity.	The paper is a source of knowledge on the usage of dark web intelligence as a defensive approach means being proactive rather than being reactive towards it.	Indicates that the hacker forums and marketplaces observed by people cannot just anticipate cyberattacks but also help the facilitation of reaction and take measures against it.	Reveals that early dark web monitoring enables predictive defense and faster incident response.
3.	Kaur, J., Hasan, S. N., et al. (2023). <i>Advanced Cyber Threats and Cybersecurity Innovation: Strategic Approaches and Emerging Solutions.</i>	Focuses on innovative defense mechanisms and cybersecurity modernization.	Supports the concept of the necessity for innovation in defense, AI, and automation included, providing a theoretical background.	Offers the next generation security strategies by showing the coalescence of Zero Trust, AI, and machine learning.	Emphasizes the importance of integrating automation and AI with human oversight in Zero Trust environments.

4.	<i>Biplob, M. B., Ahsan, K. M. M., Farabi, A. M., Konika, M. S., & Ahmed, A. (2024). From Data Breaches to Defense Strategies: A Study of Cybersecurity Information Systems Latest Trends and Future Paradigms.</i>	Examines data breach patterns and evolving defense paradigms.	Gives a comparative background of the current cybersecurity systems and their inability to deal with them are the main reason behind the initiative for Zero Trust and predictive defense call.	Establishes continuous verification models as the main requirement due to the correlation between increased data breaches and the models.	Highlights the move toward data-centric defense and the growing need for identity-based access control.
5.	<i>Saleh Alzahrani et al. (2023). A Survey of Ransomware Detection Methods.</i>	Analyzes different techniques used to detect and mitigate ransomware attacks.	Implies a deeper layer of evaluation for the ransomware defense and serves as evidence for findings that support technical mitigation strategies.	Points out the importance of hybrid approaches machine learning plus heuristic detection for the advancement of ransomware resistance.	Reinforces that layered detection systems combining ML and heuristic methods improve ransomware resilience.
6.	<i>Aslam, N., & Steltzer, H. (2025). Cybersecurity and Network Security: Strengthening Defenses Against Emerging Threats.</i>	Discusses modern network security challenges and solutions.	Offers up-to-date information (2025) to confirm the integration of AI and Zero Trust in contemporary defense systems.	Enables the implementation of a multi-layered, adaptable, and policy-driven cybersecurity framework.	Confirms that effective defense requires combining technical, procedural, and policy measures for resilience.

Table 1: Literature Survey

DATA COLLECTION

Firstly, and foremost, ransomware is still the main factor behind the threat landscape, as it is the most lucrative and easily scalable kind of attack. To the best of their knowledge, the authors point out that the attackers combine highly sophisticated technical means with social engineering in order to achieve their goals in the

cases of the latest ransomware attacks. In order to take over a system, the hackers after gaining control of the network, employ legitimate administrative tools so as to be undetected, access different parts of the network, and then carry out data encryption. The changes in ransomware, for instance, reflect not only the cybercriminals' adoption of advanced techniques but also the fact that the cybercriminal groups have become more

structured and professional.

By the same token, the switch to Zero Trust architectures has enabled organizations to be more secure as they do not excessively depend on setting up static boundaries, and also, they emphasize continuous verification. However, there is still some disparity in terms of how fully the scheme is put into practice. The majority of enterprises cannot integrate Zero Trust concept entirely due to technical and resource-related issues, as well as the difficulties brought about by the huge volume of data concerning identity and access. Consequently, the conversion to the Zero Trust model comprises a technical problem and an organizational problem as well, thus it necessitates not only the support of top management but also the continuous flow of funds.

Besides that, dark web intelligence equips the security teams with an excellent early warning system but uncovers problems in handling or managing the data, confirming their authenticity, and ensuring ethical oversight. The different sources of information about the dark web, when properly merged with the non-public local monitoring tools, can provide more accurate and faster detection and hence, shorten response time. The matter of quantity and instability of the dark web data also means that the work of automation must be supported by a team's expertise. Efficient utilization of the said intelligence relies on

technology-enabled productivity and human contextual judgment being well balanced.

DATA ANALYSIS

1. Ransomware Attack Distribution

- **Phishing is the major source of the ransomware attacks:**

The pie chart illustrates that phishing is responsible for as much as 50% of the total ransomware attack scenarios, hence it is the most frequent way. This highlights the absolute necessity of user awareness training and advanced email filtering as means of fighting the ransomware threat.

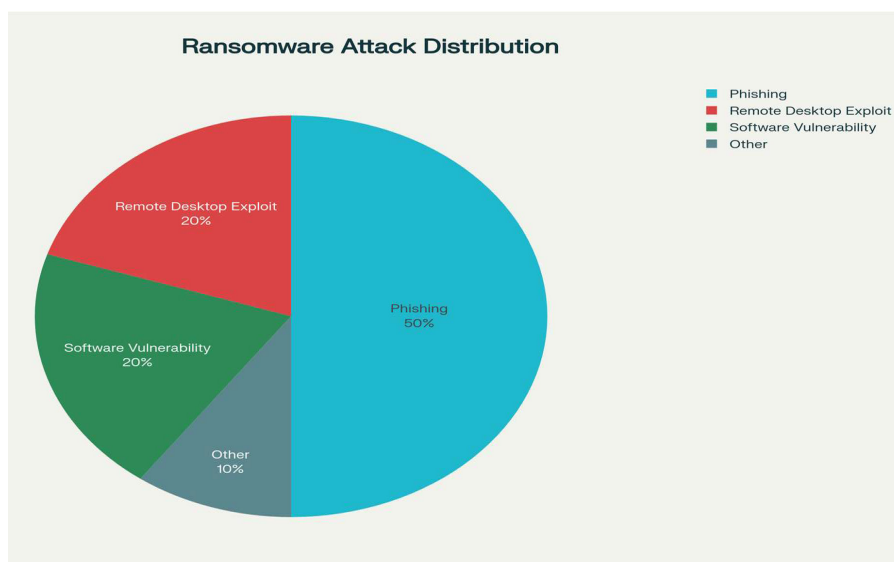
- **Vulnerability exploitation and remote access:**

Attacks on remote desktop (20%) and software vulnerabilities (20%) are, therefore, the two largest reasons for the increase in the ransomware situations. To lessen their risks, companies should make sure their remote access devices are secure and that they are patching their software regularly.

- **Other Methods which are a Concern:**

The last 10% that is accounted for by 'Other' tells us that the attackers are continuously evolving, and security teams have to be always adaptable.

Fig 1: Ransomware Attack Distribution (Pie Chart Analysis)



2. Zero Trust Adoption by Industry

• Government Adoption Leads:

The graph illustrates that among all sectors, the government has the highest percentage of Zero Trust adoption (70%) possibly as a result of strict compliance and protection requirements.

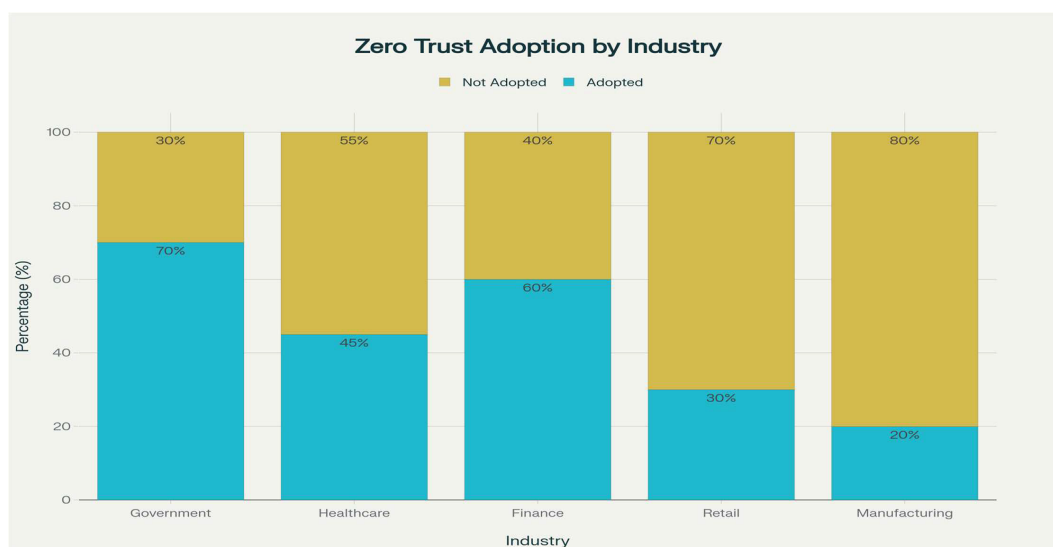
• Finance and Healthcare Show Significant Uptake:

Both Finance (60%) and Healthcare (45%) have made substantial investments in Zero Trust, which is quite logical considering the confidentiality of their data and industry regulations.

• Retail and Manufacturing Lag Behind:

Retail (30%) and Manufacturing (20%) are behind in the adoption of the practice, which could be a result of limited resources or the slower pace of digital transformation in these industries.

Fig 2: Zero Trust Adoption Across Industries (Bar Chart Analysis)



3. Dark Web Intelligence Adoption Over Time

• Steady Growth in Intelligence Feeds:

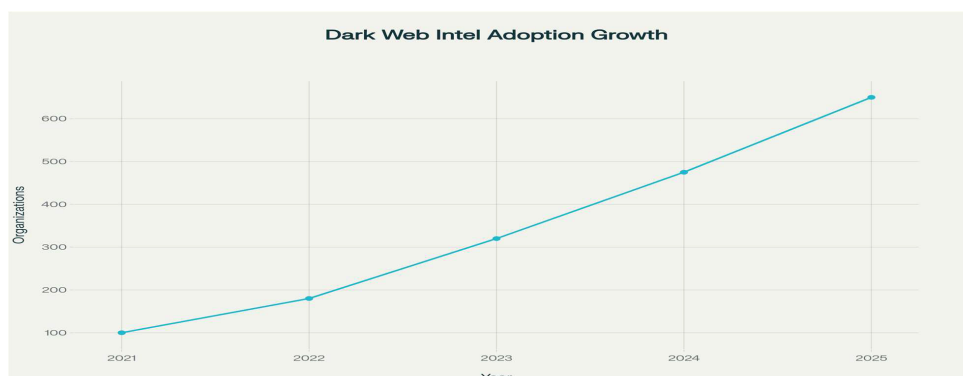
The line graph exhibits robust, uninterrupted growth in the number of entities utilizing dark web intelligence, climbing from 100 in 2021 to 650 in 2025. This is indicative of the growing acknowledgment of the worth of the check for

the threats that are both visible and invisible in the underground forums.

• Proactive Security Measures Becoming Mainstream:

Several enterprises have started employing dark web information to discover security infringements, get access to credentials, and signs for the future, thus demonstrating a move to cybersecurity that is proactive.

Growth in Dark Web Intelligence Adoption (Line Chart)



RESULT

These insights draw attention to the interdependence of the evolution of ransomware, the innovation of defense, and the gathering of intelligence. The unending stream of data from all over the world is a source of power for defenders, at the same time, it is a tool for attackers. In the case, where ransomware operations are escalated to the level of full automation, the defenders should be able to use the same level of automation for detection and response. Artificial intelligence as well as machine learning are two technologies which by far are most important in this regard since they empower systems to execute large volume of data operations and to locate abnormalities instantaneously. However, these devices are not perfect and the enemy can use them as a target for data poisoning and adversarial attacks.

On the other hand, when Data Driven Threat Intelligences are complemented with Zero Trust, they become a very strong tool of protection against cyber-attacks in a world where there is heavy data traffic. Nevertheless, it cannot perform the work on its own; in fact, it requires a complete overhauling of the trust, access, and accountability concepts. Customer organizations are to educate their staff, govern the identities better and be transparent riding the data usage train. In like manner, although monitoring of the dark web increases the capacity to detect and prevent attacks, it puts issues such as surveillance, privacy, and the possibility of abuse of sensitive information that lie there in question.

To sum up, proper cybersecurity is a result of collaboration between both human and machine. While automatized methods have a greater speed when it comes to data processing as compared to humans, the latter are still indispensable for interpretation and understanding the context, decision-making on the prioritization of the responses and the recognition of the social/human aspects of security-related actions. The sources of information are in agreement that the present-day security issues can be effectively dealt with only through integration of technical defenses, regulation by policy, and constant education.

Absence of the human factor means that even the most sophisticated systems are open to being manipulated and making errors.

Conclusion

Ransomware, Zero Trust, and dark web intelligence are the major factors that will influence cybersecurity in the future interrelating. The persistence of Ransomware reflects both its technological advancement and an economic motivation, while Zero Trust is a strategic turn to an adaptive, data-centric defense. However, the dark web intelligence additionally provides a predictive element that enables the security team to be one step ahead by identifying the initial attack. On their own, these components lead to an entirely new cyber security framework that is not only proactive but also data-driven and socially aware.

The chances of these factors disappearing are almost as high as the chances that they exist. Therefore, these large, continuous data sets require ongoing analysis, automation, and checking. The boundary separating spying on intelligence and privacy violation should always be there. Also, while technology for the defense is getting more sophisticated, the attackers will become more intelligent as well, and they will use artificial intelligence and similar data streams for their tactical development. Hence, the next research paper should focus on adversarial resilience, the ethical use of AI, and collaboration between countries in the implementation of cyber laws.

IT departments can no longer treat cybersecurity as a purely technical problem that they need to solve. Society as a whole must now see it as an urgent issue that demands its attention. Some of the minimum conditions necessary to make progress in the digital era are: protecting the authenticity of data, ensuring that digital systems can be trusted, and adhering to ethical standards in surveillance. Additionally, as the line between human creativity and machine autonomy becomes increasingly indistinct, we will have to change our idea of defense accordingly a model that is just as dynamic, intelligent, and able to learn from the attacks it wants to resist.

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Entrepreneurial Curriculum at School Level in India: Analysis of Current Frameworks and Future Prospects

Dr.Usha Rani Malik¹ & Ms Charul Chhokra²

ABSTRACT

As India moves toward a knowledge-based economy, the integration of entrepreneurship education (EE) at the school level has become a national priority. This paper examines the evolution of entrepreneurial curricula in India, specifically focusing on the National Education Policy (NEP) 2020, the CBSE Senior Secondary syllabus, and the Delhi Government's Entrepreneurship Mindset Curriculum (EMC). Through a qualitative review of current pedagogical frameworks, the study identifies a shift from theoretical business management to experiential "mindset" development. Findings suggest that while initiatives like "Business Blasters" have improved student self-efficacy, systemic challenges such as teacher training and rigid assessment models persist. The paper concludes with recommendations for a multidisciplinary approach to foster innovation among India's youth.

Keywords: entrepreneurship education, NEP 2020, Atal Tinkering Labs, Entrepreneurship Mindset Curriculum (EMC), Business Blasters, CBSE, pedagogical transformation, experiential learning, India, youth innovation, vocational integration, teacher training.

INTRODUCTION

The 21st-century global economy demands more than just rote academic proficiency; it requires adaptability, critical thinking, and a risk-taking

spirit. In India, a country with a burgeoning youth population and a pressing need for job creation, the transition from being a "nation of job seekers" to a "nation of job creators" is a strategic imperative (Ministry of Education, 2020). Entrepreneurship education (EE) at the school level serves as the foundation for this transformation.

Traditionally, Indian schooling was characterized by a "safe" career mindset—prioritizing medicine, engineering, or civil services. However, the rise of the Indian startup ecosystem has necessitated a curricular overhaul. This paper explores the current state of entrepreneurial curricula in Indian schools, evaluating how recent policy changes are shaping the next generation of innovators.

LITERATURE REVIEW

Evolution of Entrepreneurship Education in India

Entrepreneurship education in India was historically confined to vocational training or high-level management institutes like the IIMs. Early school-level efforts were largely theoretical, focusing on the "mechanics" of business such as accounting and law rather than the "spirit" of innovation. Thippanna et al. (2023) argue that early curricula failed because they did not address the psychological barriers to entrepreneurship, such as the fear of failure rooted in Indian cultural norms.

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The Role of NEP 2020

The **National Education Policy (NEP) 2020** represents a paradigm shift. It advocates for the "universalization of education" with a heavy emphasis on vocational integration and 21st-century skills. Unlike previous policies, NEP 2020 views entrepreneurship not as a standalone subject but as a cross-curricular competency involving "innovation, research, and problem-solving" (Extramarks, 2025).

Current Curricular Frameworks

CBSE Entrepreneurship (Subject Code 066)

The Central Board of Secondary Education (CBSE) offers Entrepreneurship as an elective for Grades 11 and 12. The syllabus for the 2024-2025 academic year is divided into several key units:

1. **Entrepreneurial Opportunity:** Sensing and scanning the environment.
2. **Enterprise Planning:** Building a comprehensive business plan.
3. **Enterprise Marketing:** Understanding branding and sales strategies.
4. **Resource Mobilization:** Learning about Angel Investors and Venture Capital (CBSE, 2024).

A critical component of this curriculum is the **Project Work**, where students must conduct market surveys and create a hypothetical business plan. This provides a bridge between classroom theory and real-world application.

METHODOLOGY

This research employs a qualitative desk-research approach, analyzing secondary data from the National Curriculum Framework (NCF), the National Education Policy (NEP) 2020, and annual reports from the Central Board of Secondary Education (CBSE). To understand the practical application, a Case Study Analysis of the Delhi Government's "Business Blasters" initiative was conducted, using publicly available

impact assessment reports from 2023-2025. The study evaluates these frameworks based on three pillars:

1. **Curriculum Design:** Is it theoretical or experiential?
2. **Teacher Autonomy:** How much freedom do educators have to mentor rather than lecture?
3. **Resource Accessibility:** Does the curriculum provide "seed" support or just "mental" support?

The Shift from "Business Studies" to "Entrepreneurial Mindset"

The Theoretical Trap

Prior to 2019, the curriculum focused on the structure of a company (Sole Proprietorship vs. Partnership) and the legalities of registration. While factual, these topics did not inspire innovation. According to the Self-Determination Theory (SDT), students require autonomy and competence to develop intrinsic motivation. The old rote-learning model suppressed these traits.

The Experiential Revolution: Delhi's EMC Model

The Entrepreneurship Mindset Curriculum (EMC) introduced a radical shift by removing the fear of grading.

- **The "Seed Money" Concept:** By providing ₹2,000 to students, the government shifted the risk from the family to the state. This is a critical psychological intervention in the Indian context, where "loss of face" or financial ruin often prevents parents from supporting their children's risky ventures.
- **The "Wall of Failure":** Many EMC-enabled classrooms now feature "Failure Walls" where students post what they learned from a rejected idea. This directly counters the traditional Indian schooling culture that penalizes errors.

Comparative Analysis: CBSE vs. State Boards state boards (like Kerala and Maharashtra) are catching up with localized versions. While CBSE has pioneered a formal elective,

Feature	CBSE (National)	Delhi EMC (State)	Kerala (ASAP Model)
Target Audience	Grades 11-12 (Elective)	Grades 9-12 (Compulsory)	Vocational Students
Primary Goal	Academic Knowledge	Mindset & Grit	Skill Development
Funding	Self-funded projects	State-provided seed money	Industry-linked stipends
Assessment	Written Board Exams	Reflective Journaling	Practical Certification

Socio-Economic Implications for India

India currently faces a "demographic dividend" that could become a "demographic disaster" if job creation does not keep pace with the 12 million youth entering the workforce annually.

Decentralization of Wealth

Entrepreneurial curricula in rural schools (through initiatives like the Atal Innovation Mission) encourage students to solve local problems—such as solar-powered irrigation or waste management—rather than migrating to overpopulated urban hubs like Bangalore or Mumbai. This promotes a decentralized economy.

Gender Parity and Entrepreneurship

Research indicates that female students in Indian government schools often show higher levels of empathy and "social entrepreneurship" focus. By normalizing business leadership in the classroom, the curriculum challenges the patriarchal notion that women should only seek "stable, indoor" jobs (Teaching, Nursing).

Strategic Recommendations for Policy Makers

The following recommendations should be elaborated upon:

- 1. **Teacher-as-Mentor Training:** Establishing a National Institute for Entrepreneurial Pedagogy.

- 2. **Alumni Integration:** Creating a "Founder-in-Residence" program where local startup founders spend two days a month mentoring school students.

- 3. **Digital Literacy Linkage:** Entrepreneurship cannot exist in a vacuum; it must be paired with coding and digital marketing modules to make the ventures scalable.

CHALLENGES IN IMPLEMENTATION

Despite policy advancements, several hurdles remain:

- **Teacher Readiness:** Most Indian teachers are trained in traditional pedagogical methods. Facilitating an "entrepreneurial mindset" requires a shift from being an instructor to being a mentor (Quest Journals, 2024).
- **Assessment Rigidity:** While the curriculum is becoming experiential, the final board exams still largely reward theoretical recall.
- **Cultural Resistance:** The societal pressure for "stable" jobs continues to deter students from taking the high-risk path of entrepreneurship (ResearchGate, 2018).

DISCUSSION AND RECOMMENDATIONS

To achieve the goals of NEP 2020, India must move beyond the elective model. Entrepreneurial

thinking should be integrated into Science, Humanities, and Arts. For instance, a biology project on sustainable farming can be paired with an entrepreneurial module on supply chains. Furthermore, the government should establish Incubation Centres within schools, similar to the Atal Tinkering Labs (ATL), to provide students with the technology needed to prototype their ideas.

THE INFRASTRUCTURE OF INNOVATION: ATAL TINKERING LABS (ATL)

Genesis and Vision

The Atal Tinkering Lab initiative was conceived to address a critical gap in the Indian schooling system: the transition from "learning" to "doing." Historically, Indian science education was confined to rigid laboratories where students performed pre-determined experiments with known outcomes. The Atal Tinkering Labs subvert this model by introducing the concept of a "Maker Space"—a workspace where young minds can give shape to their ideas through hands-on do-it-yourself (DIY) mode.

The vision is to "cultivate one million children in India as Neoteric Innovators." By providing access to high-end technology that was previously reserved for engineering colleges, the government has effectively democratized innovation. As of 2024, over 10,000 Atal Tinkering Labs have been established across 700+ districts, reaching over 7.5 million students.

Curricular Integration and Technical Components:

An Atal Tinkering Lab (ATL) is not merely a room full of gadgets; it is a structured learning environment. The curriculum within these labs is designed around the "Four Pillar Model" of innovation:

1. Ideation: Identifying community problems (e.g., water wastage, traffic congestion).

2. Design Thinking: Empathizing with the user and defining the solution.

3. Prototyping: Building the physical or digital model.

4. Testing: Iterating based on real-world feedback.

To facilitate this, every ATL is equipped with an "Equipment Kit" that includes:

- **Electronic Development Tools:** Arduino and Raspberry Pi boards for coding and hardware interfacing.

- **Rapid Prototyping Tools:** 3D printers and filament guns.

- **Sensors and Actuators:** IoT (Internet of Things) components like ultrasonic sensors, soil moisture sensors, and Bluetooth modules.

- **Robotics Kits:** For understanding mechanical automation.

The Role of A In The Entrepreneurial Journey

The ATL acts as a "pre-incubator." In the context of an entrepreneurial curriculum, its role can be broken down into three distinct phases:

1. From Science to Solutions (Problem Identification)

The ATL curriculum encourages students to look beyond their textbooks. Through the **Atal Tinkering Challenges**, students are prompted to solve problems aligned with the Sustainable Development Goals (SDGs). For example, a student in a rural ATL might notice the lack of affordable soil testing for farmers and use the lab's sensors to build a low-cost pH meter. This transition—from identifying a pain point to envisioning a product—is the core of the entrepreneurial mindset.

2. The "Fail Fast" Philosophy

In a traditional Indian classroom, failure is penalized through marks. In an ATL, failure is a data point. The iterative nature of 3D printing and coding teaches students that a "bug" or a "failed print" is simply a step toward a refined product. This builds **psychological resilience**, a trait cited by entrepreneurs as more critical than capital. The lab environment fosters "grit," allowing students to pivot their ideas without the stigma of academic failure.

3. Creating "Market-Ready" Mindsets

While the labs are tech-heavy, the Atal Innovation Mission has increasingly integrated business logic into the labs through the ATL Marathon. This is a national-level innovation challenge where students don't just present a gadget; they must present a "Business Case." They are required to define their target audience, estimate production costs, and explain the scalability of their innovation. This encourages students to consider the economic viability of their scientific creations.

MENTORSHIP AND THE "SHERO" EFFECT

A unique aspect of the ATL's role in the curriculum is the **Mentor India** initiative. NITI Aayog has engaged thousands of corporate professionals and successful entrepreneurs to volunteer their time at these labs. This exposure is revolutionary for students in Tier-2 and Tier-3 cities who may never have met a CEO or a startup founder.

Furthermore, ATLs have played a significant role in bridging the gender gap in STEM and entrepreneurship. By providing a safe, school-based space for girls to tinker with electronics and machinery, these labs are dismantling the stereotype that "hard tech" is a male domain. Success stories of "Sheroes"—young female innovators from ATLs—are frequently highlighted to inspire a more inclusive entrepreneurial ecosystem.

The Pedagogical Pivot: Re-engineering

Teacher Training for Entrepreneurship

The "Mindset Gap" in Traditional Educators

The primary barrier to an entrepreneurial curriculum in India is not the lack of infrastructure, but the "Certainty Bias" of the teaching workforce. Most educators in the Indian K-12 system have been trained under the **Behaviourist model**, where success is defined by the accurate reproduction of known facts. Entrepreneurship, conversely, is rooted in **Constructivism and Effectuation Theory**, where the future is unpredictable and success is born from iterative failure.

Research indicates that teachers often view "entrepreneurship" as synonymous with "Vocational Training" or "Business Management." Training modules must, therefore, first deconstruct these myths.

National Initiatives: NISHTHA and PM SHRI

Under the NEP 2020, the Department of School Education and Literacy launched NISHTHA (**National Initiative for School Heads' and Teachers' Holistic Advancement**). This program has been expanded to include modules on:

- **Experimental Learning:** Moving lessons from the blackboard to the community.
- **Social-Emotional Learning (SEL):** Helping teachers manage the anxiety students feel when a "Business Blaster" project fails.
- **ICT Integration:** Training teachers to use digital tools to help students track their "startup" progress.

THE MENTOR-TEACHER MODEL IN DELHI

A standout feature of the Delhi EMC is the creation of a specialized cadre of "Mentor Teachers." These are not outside consultants but experienced government school teachers who have been relieved of standard classroom duties to coach their peers.

The training for these mentors focuses on **Socratic Questioning**. Instead of giving a student a solution to a supply chain problem, the teacher is trained to ask: "What happened when you tried to source this locally?" or "How would your customer feel if the price doubled?" This shift from giving answers to asking the right questions is the cornerstone of entrepreneurial pedagogy.

CORPORATE-ACADEMIC SYNERGY IN TRAINING

A significant trend in 2024-2026 is the involvement of industry leaders in teacher workshops. Organizations like **NASSCOM**, **TiE (The Indus Entrepreneurs)**, and **Intel** have partnered with state boards to conduct "Bootcamps for Educators." These sessions expose teachers to:

1. **Lean Startup Methodology:** Teaching the concept of a Minimum Viable Product (MVP).
2. **Agile Frameworks:** How to manage a classroom project that changes every week.
3. **Intellectual Property Rights (IPR):** Training teachers to identify when a student's project is "patentable."

BARRIERS TO EFFECTIVE TRAINING

Despite these efforts, systemic "friction points" persist:

- **The "Shadow Curriculum":** Teachers often feel torn between the new "mindset" goals and the pressure to complete the "standard" syllabus for high-stakes exams.
- **Language Barriers:** Much of the global literature on entrepreneurship is in English. Translating these nuanced concepts into vernacular languages (Hindi, Tamil, Marathi) without losing the "spirit of innovation" remains a challenge.

- **Resource Inequality:** For example, a teacher in a high-tech ATL in South Delhi has a vastly different training requirement than a teacher in a single-room school in rural Bihar.

Conclusion

The integration of entrepreneurship into Indian schools is no longer a luxury; it is a structural necessity. While the **NEP 2020** provides the roadmap, the success of this curriculum lies in its execution at the "grassroots" level. India must ensure that the "spirit of inquiry" is not stifled by the "weight of the textbook." If executed correctly, the Indian classroom will transform from a place of passive consumption to a laboratory of active creation.

The Atal Tinkering Labs represent the "physicality" of India's entrepreneurial shift. By moving the focus from the blackboard to the workbench, ATLs are ensuring that the NEP 2020's goals are not just aspirational. They are the factories where the next generation of Indian innovators is being forged, one prototype at a time.

For the entrepreneurial curriculum to be sustainable, teacher training cannot be a one-time "induction" program. It must be a **Continuous Professional Development (CPD)** cycle. As India's startup ecosystem evolves, the curriculum—and the teachers who deliver it—must remain in a state of permanent "Beta testing," constantly refining their methods to match the speed of the market.

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Discipline and Consistency as Catalysts for Holistic Development

Dr. Arti Bahuguna

ABSTRACT

Holistic development has emerged as a central objective of contemporary education, emphasizing balanced growth across intellectual, emotional, social, moral, and professional domains. While talent and opportunity contribute to success, sustainable development is primarily driven by discipline and consistency. This article examines discipline as self-regulation and structured commitment, and consistency as sustained effort over time. Drawing upon psychological theories, educational philosophy, and institutional practices, the paper argues that these two virtues function as catalytic forces in transforming potential into excellence. The discussion situates discipline and consistency within higher education contexts, highlighting their role in character formation, academic integrity, professional competence, and institutional culture. The study concludes that holistic development is not the product of sporadic achievement but of structured, value-based, and consistent engagement.

Keywords: Discipline, Consistency, Holistic Development, Higher Education, Character Formation, Academic Excellence

INTRODUCTION

In an age characterized by rapid technological transformation and shifting educational paradigms, institutions increasingly emphasize holistic development as a primary goal. Holistic development refers to the integrated growth of the individual—intellectually, emotionally,

socially, ethically, and professionally. However, such development does not occur spontaneously. It demands foundational virtues that sustain effort over time.

Two such virtues—discipline and consistency—serve as catalytic agents in shaping enduring growth.

Aristotle profoundly observed, “We are what we repeatedly do. Excellence, then, is not an act, but a habit.”

This statement captures the essence of the present discussion. Excellence is neither accidental nor momentary; it is cultivated through disciplined structure and consistent practice.

CONCEPTUALIZING DISCIPLINE

The term discipline originates from the Latin *disciplina*, meaning instruction or knowledge. Contrary to popular perception, discipline is not synonymous with punishment or restriction. Rather, it signifies guided self-regulation and intentional action.

Jim Rohn aptly states: “Discipline is the bridge between goals and accomplishment.”

DISCIPLINE AS SELF-REGULATION

From a psychological perspective, discipline represents the capacity for delayed gratification, impulse control, and goal-oriented behavior (Duckworth, 2016). Self-discipline strengthens

executive functioning and supports long-term achievement.

DISCIPLINE AS STRUCTURED FREEDOM

Paradoxically, discipline creates freedom. When individuals adhere to structure, they free themselves from chaos, procrastination, and indecision. Structured routines enhance clarity and cognitive focus.

John C. Maxwell emphasizes:

“Small disciplines repeated with consistency every day lead to great achievements gained slowly over time.”

UNDERSTANDING CONSISTENCY

Consistency refers to the sustained repetition of purposeful actions aligned with defined goals. While motivation may initiate action, consistency ensures continuation.

Angela Duckworth (2016) defines sustained effort combined with passion as “grit,” emphasizing that long-term perseverance outperforms short-term intensity.

Bruce Lee famously remarked:

“Long-term consistency trumps short-term intensity.”

This insight is particularly relevant in academic and professional contexts, where gradual progress accumulates into significant transformation.

HOLISTIC DEVELOPMENT: A MULTIDIMENSIONAL FRAMEWORK

Holistic development encompasses multiple interconnected dimensions:

1. Intellectual Growth
2. Emotional Maturity
3. Social Competence
4. Moral and Ethical Integrity
5. Physical and Mental Well-being
6. Professional Excellence

Discipline provides structural alignment across these domains, while consistency ensures sustained engagement.

DISCIPLINE AND INTELLECTUAL DEVELOPMENT

Intellectual growth demands sustained cognitive engagement. Disciplined learners allocate time for deep reading, research, reflection, and analysis.

Benjamin Franklin observed:

“An investment in knowledge pays the best interest.”

However, knowledge acquisition requires structured effort. Consistent study habits enhance retention, critical thinking, and analytical reasoning. Faculty members who maintain disciplined research practices contribute meaningfully to scholarship and institutional reputation.

Emotional Development and Resilience

Emotional intelligence develops through self-awareness and emotional regulation—core aspects of discipline.

Stephen Covey (1989) noted:

“The key is not to prioritize what’s on your schedule, but to schedule your priorities.”

Emotional discipline helps individuals manage stress, respond constructively to criticism, and remain resilient during setbacks. Consistency in reflective practices such as journaling or mindfulness strengthens emotional balance.

SOCIAL AND ETHICAL DIMENSIONS

Institutions function as collaborative ecosystems. Discipline fosters punctuality, accountability, and respectful interaction. Consistency in ethical conduct builds trust.

Mahatma Gandhi wisely stated:

“Your beliefs become your thoughts, your thoughts become your words, your words become your actions, your actions become your habits, your habits become your values, your values become your destiny.”

This progression illustrates how consistent disciplined actions shape character and destiny.

Academic integrity, professional ethics, and civic responsibility flourish in environments where disciplined norms are consistently practiced.

DISCIPLINE AND PROFESSIONAL EXCELLENCE

Professional competence is rarely a product of talent alone. Skill mastery requires repeated, deliberate practice (Ericsson, 2006).

Will Durant’s interpretation of Aristotle echoes: “We are what we repeatedly do. Excellence is not an act, but a habit.”

Leaders who demonstrate consistent ethical behavior cultivate credibility and institutional trust. In higher education settings, disciplined lesson planning, consistent evaluation, and continuous professional development enhance both teaching quality and student outcomes.

PSYCHOLOGICAL FOUNDATIONS

Self-Determination Theory

Deci and Ryan (2000) emphasize autonomy, competence, and relatedness as drivers of intrinsic motivation. When discipline becomes self-imposed rather than externally enforced, it nurtures authentic growth.

Growth Mindset

Dweck (2006) argues that abilities develop through sustained effort. Consistency reinforces belief in improvement.

Habit Formation

Neuroscientific research demonstrates that

repeated behaviors strengthen neural pathways. Consistency transforms effort into automaticity.

Institutional Culture and Collective Growth

For discipline and consistency to catalyze holistic development, they must extend beyond individuals to institutional culture.

Peter Drucker asserted:

“Culture eats strategy for breakfast.”

Even the most innovative strategies fail without disciplined execution and consistent follow-through. Institutions that cultivate punctuality, academic integrity, research engagement, and continuous evaluation create environments conducive to excellence.

CHALLENGES IN CONTEMPORARY CONTEXT

Despite their importance, discipline and consistency face modern challenges:

- Digital distractions
- Culture of instant gratification
- Burnout and stress
- Overemphasis on short-term outcomes

Addressing these requires adaptive discipline—firm yet humane—and balanced routines that protect well-being.

As James Clear (2018) notes:

“You do not rise to the level of your goals. You fall to the level of your systems.”

Thus, sustainable systems rooted in discipline and consistency is essential.

STRATEGIES FOR CULTIVATING DISCIPLINE AND CONSISTENCY

1. Goal clarity and structured planning
2. Reflective self-assessment
3. Mentorship and role modeling
4. Continuous evaluation systems

5. Recognition of sustained effort
6. Balanced routines promoting well-being

When discipline becomes internalized and consistency becomes habitual, growth becomes organic.

CONCLUSION

Discipline provides direction.
Consistency provides momentum.
Holistic development is the destination.
Together, discipline and consistency transform fragmented effort into integrated excellence. They cultivate intellectual depth, emotional maturity, ethical integrity, and professional competence. For faculty and students alike, these virtues are not restrictive constraints but empowering frameworks.

As Swami Vivekananda powerfully declared:

“Take up one idea. Make that one idea your life—think of it, dream of it, live on that idea.”

Such dedication reflects disciplined consistency—the cornerstone of holistic growth.

In a rapidly changing world, institutions that embed discipline and consistency within their culture will not merely produce graduates; they will nurture responsible citizens and transformative leaders.

Holistic development, therefore, is not a momentary achievement but a sustained journey—guided by discipline and strengthened by consistency.

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THE AI-POWERED ECONOMY: TRANSFORMING EMPLOYMENT, SKILLS AND GLOBAL LABOUR MARKETS

Dr. Nidhi Tewatia

ABSTRACT

The rapid advancement of Artificial Intelligence (AI) is reshaping the global economic landscape, redefining traditional employment structures, skill requirements, and labour market dynamics. As organizations increasingly adopt AI-driven technologies, automation, machine learning, robotics, and generative AI are transforming industries, creating new economic opportunities while simultaneously disrupting conventional job roles. The emergence of the AI-powered economy has accelerated productivity growth, enhanced operational efficiency, and fostered innovation across sectors. However, it has also raised concerns regarding workforce displacement, skill obsolescence, wage polarization, and digital inequality. This study explores the transformative impact of AI on employment patterns, emerging skill demands, and global labour markets. Through an extensive review of contemporary literature, international reports, and economic analyses, the paper examines both the opportunities and challenges associated with AI adoption. The study highlights the growing importance of reskilling, lifelong learning, digital competencies, and adaptive policy frameworks to ensure inclusive economic growth. The findings suggest that while AI may automate routine tasks, it is simultaneously generating new occupations, enhancing human productivity, and creating pathways for sustainable economic development. The paper concludes that successful integration of AI into the global economy requires a balanced approach that combines technological innovation with human capital development and ethical governance.

Keywords: Artificial Intelligence, Employment, Future of Work, Labour Markets, Digital Economy, Skills Development, Automation, Economic Growth

INTRODUCTION

The global economy is currently experiencing one of the most significant technological transformations since the Industrial Revolution. Artificial Intelligence (AI), once considered a futuristic concept, has rapidly evolved into a powerful economic force influencing production systems, business operations, consumer behaviour, and labour markets worldwide. The proliferation of AI technologies, including machine learning, natural language processing, robotics, computer vision, and generative AI systems, is redefining the nature of work and creating new paradigms of economic development.

The emergence of the AI-powered economy has fundamentally altered the relationship between technology and labour. Historically, technological advancements have contributed to productivity improvements and economic growth while simultaneously transforming employment structures. Similarly, AI is reshaping industries by automating repetitive tasks, augmenting human capabilities, and generating entirely new categories of employment. Sectors such as manufacturing, healthcare, finance, education, retail, transportation, and public administration are witnessing unprecedented levels of digital transformation. While AI offers substantial economic benefits through enhanced productivity,

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cost reduction, and innovation, concerns regarding job displacement, workforce inequality, and skill mismatches have become central to contemporary economic discussions. The increasing adoption of intelligent technologies has raised critical questions about the future of work, the sustainability of employment, and the preparedness of workers to adapt to changing labour market requirements.

Recent studies indicate that occupations involving routine and repetitive activities are more susceptible to automation, whereas jobs requiring creativity, critical thinking, emotional intelligence, and complex decision-making remain relatively resilient. Consequently, governments, businesses, educational institutions, and international organizations are actively exploring strategies to equip workers with future-ready skills and facilitate smooth transitions within evolving labour markets. The AI-powered economy presents both opportunities and challenges. On one hand, AI has the potential to stimulate economic growth, create high-value jobs, improve service delivery, and promote innovation. On the other hand, it may exacerbate inequalities, widen digital divides, and create labour market disruptions if appropriate policy interventions are not implemented. In this context, understanding the implications of AI for employment, skills development, and labour market transformation is essential for designing effective economic and social policies. This study seeks to provide a comprehensive examination of these issues while identifying pathways toward inclusive and sustainable growth in the age of Artificial Intelligence.

RESEARCH OBJECTIVES

- To examine the emergence, evolution, and key characteristics of the AI-powered economy and its role in contemporary economic development.
- To analyze the impact of Artificial Intelligence on global employment patterns, labour market structures, and workforce transformation.
- To identify the emerging skill requirements,

competencies, and workforce adaptation strategies necessary for success in the AI era.

- To evaluate the economic opportunities and challenges associated with AI adoption, particularly in relation to productivity, wages, workforce inclusion, and sustainable growth.
- To assess the role of governments, educational institutions, and businesses in facilitating workforce readiness and to propose policy recommendations for fostering inclusive and resilient AI-driven economies.

RESEARCH METHODOLOGY

This study adopts a descriptive and analytical research design based primarily on secondary sources of data. Information has been collected from research articles, international labour reports, economic surveys, policy documents, industry publications, and reports published by global organizations such as the International Labour Organization (ILO), World Economic Forum (WEF), International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), and World Bank.

The study employs qualitative content analysis to examine emerging trends in AI adoption and labour market transformation. Comparative analysis has been used to evaluate the impact of AI across different industries and regions. Furthermore, thematic analysis has been conducted to identify key opportunities, challenges, and policy implications associated with the AI-powered economy.

The research aims to provide a comprehensive understanding of how Artificial Intelligence is reshaping employment, skills, and labour markets while offering practical insights for policymakers, educators, business leaders, and researchers navigating the future of work.

EVOLUTION OF THE AI-POWERED ECONOMY

The AI-powered economy represents a new phase of economic development characterized

by the integration of artificial intelligence into production processes, business models, and decision-making systems. Unlike previous technological revolutions that primarily mechanized physical labour, AI increasingly automates cognitive tasks, enabling machines to learn, reason, predict, and generate outputs that traditionally required human intelligence.

The evolution of the AI-powered economy can be understood through three major phases:

- **Automation Era (1990–2010)**

This phase witnessed the adoption of computerization and industrial automation. Organizations focused on reducing manual labour through information technology systems and robotics. While automation improved efficiency, its scope was largely confined to repetitive tasks.

- **Data Economy Era (2010–2020)**

The widespread availability of digital data, cloud computing, and advanced analytics transformed businesses into data-driven organizations. Companies began utilizing predictive analytics, machine learning, and algorithmic decision-making to improve productivity and customer engagement.

- **AI Economy Era (2020–Present)**

The emergence of Generative AI, Large Language Models (LLMs), autonomous systems, and intelligent automation has accelerated the transition toward an AI-centric economy. AI now contributes to product development, healthcare diagnostics, financial forecasting, educational services, and public administration. The AI-powered economy is increasingly becoming a major driver of global competitiveness, innovation, and productivity growth.

TRANSFORMING EMPLOYMENT IN THE AGE OF AI

Artificial Intelligence is fundamentally transforming the nature of employment across industries. Rather than simply eliminating jobs, AI is reshaping occupational structures and redefining workforce responsibilities.

- **Automation of Routine Occupations**

Jobs involving repetitive and predictable tasks are particularly vulnerable to automation. Examples include:

- Data entry operators
- Telemarketing executives
- Bookkeeping clerks
- Assembly-line workers
- Administrative assistant

Organizations increasingly deploy AI-powered systems capable of performing these functions with greater speed and accuracy.

- **Job Augmentation Rather Than Job Replacement**

Many occupations are experiencing augmentation rather than complete replacement. AI assists professionals by enhancing productivity and supporting decision-making.

Examples include:

- Doctors using AI-assisted diagnostics.
- Lawyers employing AI-based legal research tools.
- Financial analysts utilizing predictive algorithms.
- Teachers integrating AI-powered learning platforms.

- **Creation of New Employment Opportunities**

The AI revolution has generated entirely new categories of jobs, including:

- AI Engineers
- Learning Specialists
- Data Scientists
- Prompt Engineers
- AI Ethics Consultants
- Human-AI Interaction Designers
- Digital Transformation Managers

The emergence of these occupations demonstrates AI's role as a creator of employment alongside its disruptive effects.

EMERGING SKILLS FOR THE FUTURE WORKFORCE

The transition toward an AI-powered economy has significantly altered the demand for workforce competencies. Traditional skills are increasingly being complemented by digital and cognitive capabilities.

- **Digital Literacy**

Basic digital proficiency has become a prerequisite across industries. Employees are expected to effectively utilize digital tools, software platforms, and AI-enabled applications.

- **Data Analytics and Interpretation**

Organizations increasingly depend on data-driven decision-making. Consequently, employees capable of interpreting and utilizing data possess a competitive advantage.

- **Critical Thinking and Problem-Solving**

While AI can process vast amounts of information, human judgment remains essential for solving complex and ambiguous problems.

- **Creativity and Innovation**

Creative thinking is becoming one of the most valuable skills in the AI era because machines cannot fully replicate human imagination, originality, and innovation.

- **Emotional Intelligence**

Skills such as empathy, communication, leadership, negotiation, and teamwork remain uniquely human and are increasingly important in service-oriented industries.

- **Lifelong Learning and Adaptability**

Rapid technological change requires continuous learning. Workers must constantly update their knowledge and adapt to evolving workplace demands.

ECONOMIC OPPORTUNITIES CREATED BY AI

The widespread adoption of Artificial Intelligence presents significant opportunities for economic growth and development.

- **Productivity Enhancement**

AI enables organizations to optimize operations, reduce costs, and improve efficiency. Increased productivity contributes directly to higher economic output and competitiveness.

- **Innovation and Entrepreneurship**

AI lowers barriers to innovation by providing entrepreneurs with advanced analytical tools, automation capabilities, and scalable business solutions.

- **Expansion of Digital Markets**

AI-driven platforms facilitate the emergence of new digital products, services, and business models, contributing to economic diversification.

- **Improved Public Service Delivery**

Governments are increasingly using AI to enhance healthcare, education, transportation, taxation, and governance systems.

- **Financial Inclusion**

AI-powered fintech solutions are expanding access to banking, credit, and financial services for previously underserved populations.

- **Sustainable Economic Development**

AI applications support sustainability by improving resource allocation, reducing waste, optimizing energy consumption, and facilitating climate monitoring.

CHALLENGES AND RISKS IN GLOBAL LABOUR MARKETS

Despite its transformative potential, AI also presents several economic and social challenges.

- **Employment Displacement**

Automation threatens workers engaged in routine and low-skilled occupations, creating concerns regarding unemployment and labour market instability.

- **Growing Income Inequality**

Highly skilled workers capable of leveraging AI technologies often benefit disproportionately, potentially widening wage and income disparities.

- **Skill Gaps and Workforce Mismatch**

The pace of technological change frequently exceeds the ability of educational systems to prepare workers for emerging occupations.

- **Digital Divide**

Unequal access to technology and digital infrastructure can exacerbate existing economic inequalities between nations, regions, and social groups.

- **Ethical and Governance Challenges**

Issues relating to algorithmic bias, privacy violations, surveillance, and accountability have become major concerns in AI deployment.

- **Market Concentration**

Large technology firms with access to extensive datasets and computational resources may

dominate AI development, increasing economic concentration and reducing competition.

COMPARATIVE ANALYSIS OF AI IMPACT ACROSS SECTORS AND REGIONS

The influence of Artificial Intelligence extends across virtually every sector of the global economy, although its magnitude and implications vary considerably depending on industry characteristics, technological readiness, workforce composition, and regional development levels. While some sectors primarily experience productivity enhancement and operational efficiency, others undergo substantial workforce restructuring and transformation of traditional job roles.

Sector	Applications of AI	Impact on Employment and Productivity
Manufacturing	Smart automation, robotics, predictive maintenance	Increased productivity with partial displacement of routine jobs and creation of advanced technical roles
Healthcare	Diagnostic systems, precision medicine, robotic surgery	Augments healthcare professionals, improves patient outcomes, and creates demand for specialized digital health skills
Finance	Algorithmic trading, fraud detection, risk assessment	Enhances decision-making efficiency while restructuring traditional banking and financial service roles
Education	Personalized learning, intelligent tutoring systems, learning analytics	Supports educators through customized instruction and promotes innovative teaching methodologies
Retail	Customer analytics, recommendation engines, inventory optimization	Improves customer experience, operational efficiency, and digital commerce capabilities
Agriculture	Precision farming, crop monitoring, predictive analytics	Enhances agricultural productivity, resource efficiency, and climate resilience
Transportation and Logistics	Autonomous vehicles, route optimization, supply chain analytics	Improves operational efficiency while transforming traditional transportation and logistics occupations

The analysis reveals that AI is not merely replacing jobs but fundamentally altering the nature of work by shifting labour demand toward higher-order cognitive, analytical, and technological skills. Industries that successfully integrate AI with human expertise are likely to experience greater productivity gains and long-term competitiveness.

Regional Perspective on AI Adoption

The economic impact of Artificial Intelligence also varies significantly across regions, reflecting differences in technological infrastructure, investment capacity, institutional readiness, and workforce skills.

Developed Economies

Advanced economies such as the United States, Germany, Japan, and South Korea possess robust digital infrastructure, substantial investments in research and development, and highly skilled workforces. These countries are well-positioned

to capitalize on AI-driven productivity gains, innovation, and industrial transformation. However, they also face challenges related to workforce displacement, demographic ageing, and the need for continuous reskilling of employees.

Developing Economies

Emerging economies, including India, Brazil, Indonesia, and South Africa, present significant opportunities for AI-enabled growth due to their large labour forces, expanding digital ecosystems, and growing technology sectors. Nevertheless, these economies continue to face challenges such as inadequate digital infrastructure, limited access to advanced technologies, skill shortages, and investment constraints. Addressing these barriers is essential to ensure that the benefits of AI are distributed equitably and contribute to inclusive economic development.

Comparative Assessment

Dimension	Developed Economies	Developing Economies
AI Adoption Rate	High	Moderate to Emerging
Digital Infrastructure	Advanced	Developing
Workforce Readiness	High	Moderate
Investment in AI Research	Significant	Limited but Growing
Job Displacement Risk	Moderate	Relatively High in Routine Occupations
Productivity Gains	Immediate and Substantial	Long-Term Growth Potential
Policy Preparedness	Well-Established Frameworks	Evolving Regulatory Systems

Overall, the comparative analysis indicates that while Artificial Intelligence serves as a catalyst for economic transformation globally, its outcomes depend largely on a country's technological preparedness, human capital development, and policy interventions. Economies that invest strategically in digital infrastructure, education, and workforce reskilling are likely to derive the greatest benefits from the AI-powered economy.

IMPLICATIONS FOR GOVERNMENTS, BUSINESSES AND EDUCATIONAL INSTITUTIONS

Governments: Governments must create enabling environments through investments in digital infrastructure, innovation ecosystems, labour market policies, and social protection mechanisms.

Businesses: Organizations should adopt responsible AI practices while investing in employee reskilling and workforce development. Human-centric AI implementation can improve productivity while preserving employee well-being.

Educational Institutions: Universities and educational institutions play a critical role in preparing future talent. Curricula must incorporate AI literacy, data analytics, digital competencies, and interdisciplinary learning approaches. Collaboration among governments, industries, and educational institutions is essential for building resilient labour markets.

FUTURE OUTLOOK AND POLICY RECOMMENDATIONS

The future of work will likely be characterized by increasing collaboration between humans and intelligent machines. Rather than replacing human workers entirely, AI is expected to augment human capabilities and create new forms of employment.

Policy Recommendations

- Promote large-scale workforce reskilling and upskilling initiatives.
- Strengthen STEM and digital education.
- Develop ethical AI governance frameworks.
- Encourage public-private partnerships in skill development.
- Expand digital infrastructure and internet accessibility.
- Support innovation, entrepreneurship, and startup ecosystems.
- Strengthen social safety nets for displaced workers.
- Foster international cooperation on AI standards and regulations.

By implementing these measures, policymakers can maximize the benefits of AI while minimizing social and economic disruptions.

CONCLUSION

Artificial Intelligence is rapidly transforming employment structures, skill requirements, and labour markets across the globe. The AI-powered economy represents both an unprecedented opportunity and a significant challenge for governments, businesses, and workers. While concerns regarding automation and job displacement remain valid, AI also offers immense potential for productivity enhancement, innovation, and economic growth. The future labour market will increasingly reward individuals who possess digital literacy, adaptability, creativity, and lifelong learning capabilities. Successful economies will be those that effectively combine technological advancement with human capital development and inclusive policy frameworks. The transition toward an AI-powered economy should therefore be viewed not as a threat to employment but as an opportunity to create more productive, innovative, and resilient societies. By fostering collaboration among policymakers, educators, businesses, and workers, the benefits of Artificial Intelligence can be harnessed to achieve sustainable and inclusive economic development.

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Financial Inclusion and Economic Growth in India: Progress, Challenges & Policy Perspectives

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ABSTRACT

By providing all societal segments with access to credit, banking, insurance & digital financial services, financial inclusion significantly contributes to inclusive and balanced economic growth in India. This particular study determines the progress of financial inclusion in India and its impact on the economic growth while using data from various reports of RBI, government publications & previous research studies. The study emphasizes that initiative such as PMJDY, digital payment mechanisms, and schemes for Direct Benefit Transfer which has significantly improved financial access and participation. Financial inclusion has positively contributed to savings, investment, employment generation, and poverty reduction. However, difficulties like financial illiteracy, digital divide, inadequate infrastructure, and cyber security risks continue to affect its effectiveness. The study comes to the conclusion that attaining equitable and sustainable economic growth requires improving digital infrastructure, financial literacy, and policy implementation.

Keywords: Financial Inclusion, India, Economic Growth, Digital Financial Inclusion.

INTRODUCTION

"Financial inclusion" means the availability of sufficient & affordable finance related services to various society segments, particularly low-income and vulnerable groups. Financial inclusion, according to the Reserve Bank of

India, is the method of providing balanced and transparent access to useful financial products & services, like banking, credit, insurance, and various payment systems. Financial inclusion is seen as essential for balanced & inclusive economic development in emerging countries like India. The general expansion of an economy over time is reflected in economic growth, which is typically assessed using metrics like GDP and per capita income. Effective savings mobilization, efficient resource allocation, and widespread economic activity involvement are all necessary for sustained economic growth. By bringing common households and small ventures into the formal and structured financial system, financial inclusion helps achieve these goals by boosting savings, making credit more accessible, and promoting profitable investment.

India has launched a number of financial inclusion programs in recent years, such as the Jan Dhan–Aadhaar–Mobile (JAM) trinity, the Pradhan Mantri Jan Dhan Yojana (PMJDY), and the spread of digital payment systems. The scope of financial services has been greatly expanded by these initiatives. Nonetheless, it is still crucial to investigate how much these advancements in financial inclusion have contributed to economic expansion.

CONCEPTUAL AND THEORETICAL FRAMEWORK

Numerous economic theories illustrate the connection among financial inclusion & economic growth. The financial intermediation

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theory states that role of financial institutions is essential in guiding savings towards lucrative endeavors, which fosters economic expansion. The supply-leading hypothesis states that the growth of financial services encourages economic growth by creating opportunities for investment and entrepreneurship.

From a conceptual standpoint, there are several interrelated ways that financial inclusion affects the growth of economy.

- Financial Inclusion
- Mobilization of Savings
- Investment Expansion
- Employment Generation
- Economic Growth

By expanding the availability for the formal financial services, financial inclusion enhances financial participation, improves resource allocation, and supports long-term social & economic development.

REVIEW OF PREVIOUS STUDIES

The connection among financial inclusion & economic growth at the national and international levels has been the subject of numerous studies.

Van et al. (2021) conducted research in order to establish a link between financial inclusion and economic growth in emerging markets. To evaluate the impact of financial inclusion on a worldwide scale, they developed a multi dimensional index. A panel econometric model based on this index was then used to evaluate that how financial inclusion affect the economic growth. The findings indicated a favorable link between financial inclusion and economic growth.

Azimi(2022) developed a comprehensive composite financial inclusion index which comprised of penetration, availability and usage of financial services and estimation of heterogeneous panel data models augmented with well-known variables. The result of the research clearly concluded that financial inclusion has a significantly positive effect on economic growth.

Hussain et al. (2024) investigated 21 Asian countries for the time period 2004 to 2019 on the basis of their development status i.e. either developing or developed. The research concluded that there is a positive long-term impact of financial inclusion on economic growth in Asia region.

Dahiya, Kumar (2020) considered three main dimensions of Financial Inclusion: Usage, penetration and accessibility in order to know that how financial inclusion in India is linked with Economic Growth for the time period 2005 to 2017. The study examined the relationship between economic growth & financial inclusion and its many dimensions (accessibility, penetration, and usage) using a Bayesian vector auto-regression model. The results demonstrate a significant correlation between India's economic growth & the utilization aspect of financial inclusion.

Pal et al. (2025) study delves into the complex link between financial inclusion—both traditional and digital—and economic growth across emerging economies from 1990 to 2022, using Dynamic Simulated ARDL and Driscoll-Kraay Standard Error techniques. Significant findings showed that while digital financial inclusion poses challenges, traditional financial inclusion has a good correlation with economic growth.

From the Indian context, existing research highlights the importance of banking outreach, microfinance, and digital financial services in promoting inclusive development.

Several studies argue that increased access to credit encourages entrepreneurship, enhances productivity, and generates employment. Other researchers emphasize that access alone is insufficient and that effective usage of financial services is equally important. The literature also identifies challenges such as regional disparities, limited financial literacy, and uneven digital infrastructure. Despite extensive research, there is still a need for comprehensive studies utilizing recent secondary data to analyze the connection between financial inclusion and economic growth in India.

RESEARCH OBJECTIVES

- To assess India's financial inclusion development.
- To evaluate how financial inclusion affects economic expansion.
- To identify challenges in achieving inclusive economic growth.
- To suggest policy measures to strengthen financial inclusion.

RESEARCH METHODOLOGY

The study is totally dependent on various secondary sources. The study has descriptive and analytical research design. Data have been extensively collected from various Annual Reports & Financial Inclusion Index of RBI, the World Bank Global Findex Database, the Economic Survey of India, and other government and institutional publications.

INDIA'S GROWTH OF FINANCIAL INCLUSION

India has witnessed tremendous progress in financial inclusion over the past few decades.

1. Bank Nationalization

The nationalization of banks in 1969 was a major step towards expanding banking services in semi-urban and rural areas. It increased the reach of formal financial institutions.

2. Lead Bank Scheme

The Lead Bank Scheme aimed to assign banks to specific districts for promoting banking and credit facilities.

3. Self-Help Groups and Microfinance

Microfinance institutions & Self-Help Groups (SHGs) have helped women and low-income households in accessing credit and savings services.

4. Pradhan Mantri Jan Dhan Yojana (PMJDY)

It was introduced in 2014 and has grown to be one of the largest financial inclusion programs globally. The program's objective is to give each household a bank account.

Key Features of the scheme

- Accounts with zero balance
- RuPay debit cards
- Accidental insurance coverage
- Direct benefit transfer (DBT)
- Overdraft facilities

The scheme has significantly contributed in increasing the number of bank accounts in India and promoted financial participation among the low-income groups.

DIGITAL FINANCIAL INCLUSION

India has experienced rapid growth in digital financial services through:

- Unified Payments Interface (UPI)
- Digital wallets
- Aadhaar-enabled payment systems
- Mobile banking
- Internet banking

Digitalization has improved accessibility and reduced transaction costs.

FINANCIAL INCLUSION AND ECONOMIC GROWTH: WHAT DOES THE EVIDENCE SAY?

8.1 Theoretical Pathways

The connection among financial inclusion & economic growth operate through several channels. At the household level, access to savings accounts enables consumption smoothing—families can set aside money during good times and draw on it during crises, avoiding distress sales of assets or high-interest borrowing. Access to credit allows investment in education, health, and productive activities. Insurance protects against catastrophic shocks that can push families into poverty traps.

At the enterprise level, small businesses with access to formal credit can invest in inventory, equipment, and expansion. They are less vulnerable to supply chain disruptions and can take on larger orders with confidence. At the

macroeconomic level, a more inclusive financial system mobilizes savings that would otherwise remain idle, channels them into productive investment, and supports consumption-driven growth.

8.2 Cross-Country Evidence

Economists have long examined the connection between growth and financial development. Everyone agrees that a healthy financial system promotes growth by better allocating capital, although the impact varies by nation and is dependent on the caliber of the institutions. More recent research focuses specifically on inclusion. Studies using cross-country data find that measures of financial access—account ownership, branch density, ATM availability—are positively correlated with GDP per capita and growth rates, even after controlling for overall financial depth. The effects appear stronger for developing countries and for reducing income inequality.

8.3 Evidence from India

India offers a natural laboratory for studying inclusion's effects, given the scale and speed of recent reforms. Several strands of evidence are worth noting.

Household consumption and investment: Studies using household survey data find that access to bank accounts is associated with higher savings rates and greater investment in children's education. The introduction of direct benefit transfers reduced leakages and improved the targeting efficiency of welfare programs, putting more money in the hands of intended beneficiaries.

Small enterprise performance: Research on the Mudra scheme suggests that access to formal credit enables micro-enterprises to expand operations and hire more workers. However, the effects are stronger for enterprises that had some prior business activity; credit alone cannot create entrepreneurship where other constraints bind.

Agricultural productivity: Access to formal credit

reduces farmers' dependence on moneylenders, who often charge exploitative rates. Studies find that farmers with bank credit invest more in inputs and adopt better practices, leading to higher yields. Crop insurance, though plagued by implementation challenges, provides some buffer against weather-related losses.

Regional growth: States with higher financial inclusion scores have, on average, experienced faster growth in per capita income. But causality is difficult to establish—richer states also tend to have better financial infrastructure. More sophisticated analyses that exploit variation in the timing and intensity of policy interventions suggest that inclusion contributes to growth, though the effect is mediated by factors like governance quality and educational attainment.

ROLE OF RBI AND GOVERNMENT

The RBI & GOI have implemented various measures such as:

- Financial literacy programs
- Priority sector lending
- Small finance banks
- Payments banks
- Direct Benefit Transfer schemes

These initiatives have strengthened financial inclusion and enhanced access to financial services.

ANALYSIS OF ECONOMIC GROWTH IN INDIA

India's economic growth during the study period has shown considerable variation due to domestic and global factors. While GDP growth accelerated during certain phases, it was also affected by economic slowdowns and external shocks. Rising per capita income levels indicate improvements in living standards, although income inequality remains a concern.

Investment patterns and sectoral growth trends suggest that improved access to finance has supported the expansion of key sectors such as agriculture, MSMEs, and services. Financial

inclusion contributes significantly to economic growth through multiple channels.

1. Mobilization of Savings

People are encouraged to save money in official financial institutions when they have access to banking services. Increased savings contribute to capital formation and investment.

2. Increased Investment

Financial inclusion improves access to credit for small businesses, farmers, and entrepreneurs, thereby increasing investment and productive activities.

3. Reduction in Poverty

Financial inclusion helps poor households manage risks, smooth consumption, and improve living standards.

4. Employment Generation

Availability of credit promotes entrepreneurship and self-employment opportunities, leading to employment generation.

5. Promotion of Digital Economy

Digital financial services reduce transaction costs, improve efficiency, and support economic modernization.

6. Inclusive Growth

Financial inclusion ensures that the perks of economical growth reach all segments of society, thereby reducing regional and social inequalities.

CHALLENGES IN ACHIEVING INCLUSIVE ECONOMIC GROWTH

Despite significant progress, India continues to face several challenges in achieving effective financial inclusion.

1. Financial Illiteracy

Many people, especially in rural areas, lack awareness about financial products and services.

2. Digital Divide

Limited internet access & lacking digital skills hinder the acceptance of digital financial services.

3. Inadequate Banking Infrastructure

Remote and rural areas still face shortages of bank branches, ATMs, and banking correspondents.

4. Poverty and Low Income

Low-income groups often hesitate to use formal banking services due to irregular earnings.

5. Gender Inequality

In many areas, women's accessibility to banking services & financial resources is restricted.

6. Cyber Security Risks

Increasing digital transactions have also increased cyber frauds and security concerns.

7. Dormant Bank Accounts

Many bank accounts opened under financial inclusion schemes remain inactive due to lack of regular transactions.

POLICY MEASURES AND SUGGESTIONS

To strengthen financial inclusion and promote inclusive economic growth, the following measures are suggested:

1. Improve Financial Literacy

The government and financial institutions should organize awareness programs to educate people about financial services and digital transactions.

2. Strengthening Digital Infrastructure

Improving connectivity via Internet and developing infrastructure in rural areas can enhance access to digital financial services.

3. Promote Women Empowerment

Special financial schemes and awareness programs should be designed for women to increase their participation in the financial system.

4. Enhance Cyber security Measures

Banks and financial institutions should strengthen cyber security systems to protect customers from digital frauds.

5. Expand Banking Services in Rural Areas

More bank branches, ATMs, and banking

correspondents should be established in underserved regions.

6. Encourage Active Usage of Accounts

Financial institutions should encourage regular use of bank accounts through incentives and simplified services.

7. Strengthen Coordination

Better coordination between government agencies, banks, fintech companies, and regulatory authorities is necessary for effective implementation of financial inclusion policies.

FINDINGS OF THE STUDY

These are the study's main findings:

1. India has made major progress in financial inclusion through schemes like PMJDY, Digital India, and Direct Benefit Transfer.
2. The spread of digital payment mechanisms like UPI has increased financial transactions and reduced dependence on cash.
3. Financial inclusion has positively contributed to economic growth by encouraging savings, investments, entrepreneurship, and employment generation.
4. Rural and economically weaker sections have benefited from access to banking and financial services.
5. Despite progress, financial illiteracy, digital divide, regional imbalance, and inadequate banking infrastructure remain major challenges.
6. Many bank accounts opened under financial inclusion schemes remain dormant due to lack of awareness and low income levels.
7. Women's participation in the formal financial system has improved but gender disparities still exist in several rural regions.
8. Cyber security and digital frauds have emerged as major concerns with the increase in use of digital financial services.

CONCLUSION

In India, financial inclusion has emerged as an effective tool for fostering social and economic advancement. The RBI & the Government of India have launched a variety of programs throughout the years to increase the connect to financial services. Banking penetration and financial engagement have greatly increased thanks to initiatives like PMJDY, digital payment systems, Aadhaar linkage, and direct benefit transfer programs. Financial inclusion contributes to economic growth by mobilizing savings, increasing investment, reducing poverty, generating employment, and promoting inclusive development. However, hindrances like financial illiteracy, digital divide, inadequate infrastructure, gender inequality, and cyber security risks continue to affect the effectiveness of financial inclusion efforts.

Therefore, attaining sustainable and equitable economic growth requires boosting cyber security, increasing financial services in rural regions, improving digital infrastructure, and strengthening financial literacy. Financial inclusion has the capacity to significantly impact India's economic growth with well-executed policies and concerted initiatives.

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Analysis of Netflix User Behaviour Using Interactive Data Visualization Dashboard

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ABSTRACT

Streaming services growing fast have shaken up how people watch shows worldwide, shifting habits away from regular TV toward watching what you want when you want it. Not just one company leads here - Netflix stands out by offering thousands of films, series, and online-only content from many countries and styles. To understand how users interact, researchers rely on live visual dashboards built with Power BI (Business Intelligence), turning messy numbers into clear insights without clutter. Instead of guessing, they examine real usage trends using a core collection of 4,529 entries from Netflix's catalog plus extra details pulled from web-based series sources. Patterns emerge around which kinds of stories get made, what age groups they target, where they come from, and how viewer tastes change over time. Starting off, the process moves step by step through a clear cycle for handling data - first tidying up messy inputs via Power Query, then linking related pieces using a star-shaped structure. It turns out films make up nearly all entries in the collection - about 95.5 percent - but series episodes still play a key role because they keep users coming back, building routines around extended viewing sessions. Right after that, findings show many titles carry higher age ratings such as TV-MA or TV-14, pointing toward programming aimed mostly at teens and grown-ups. Near the end, it becomes obvious that live dashboards work better than old-style reports when studying streaming platform trends,

giving clearer insights that support choices across online entertainment businesses.

Keywords: Netflix, OTT Platforms, User Behavior Analysis, Data Visualization, Power BI, Business Intelligence.

INTRODUCTION

Streaming services changed how people watch shows online, making it possible to view whenever you want. Across the globe, Netflix adjusts what it offers by studying what viewers tend to pick. Patterns in choices show up through details such as categories, scores, and when titles appear. Seeing numbers clearly often means shaping them into images that make sense at a glance [6].

1.1 Background of the Study

- Now streaming beats old TV. Faster web connections helped shift how people watch shows. Phones in pockets changed viewing habits too. Broadband everywhere made big files move fast. Old cable setups fade as online services grow.
- Viewers pick when, where they play videos now. Internet gadgets handle what networks once controlled alone Streaming giant Netflix operates across more than 190 countries [1], serving tailored shows alongside worldwide

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hits. Because of how it handles information, personal viewing records stay hidden from public view. Insights still emerge through details such as genre tags, age ratings, production origins, and when titles came out.

- Most folks move through this space in similar ways, almost without thinking. Spotting these habits helps spot which stories catch on - or quietly vanish. Visuals like charts [6] take huge stacks of figures and give them shape, helping eyes grasp what words alone might bury. Seeing the numbers changes how they feel, less cold, more clear.

1.2 Importance of Data Analytics in OTT Platforms

- Staying in the viewer's mind counts heavily, even alongside drawing new audiences for streamers. Patterns hiding within watch history reveal which tales, tones, or age-focused content hold attention longest. Past picks guide future ones - studying them shapes what gets greenlit or acquired later. Trends once successful quietly steer today's programming paths. Decisions emerge less from guesses, more from traces left behind.
- Most of what Netflix knows about viewer habits comes from number patterns, showing which series succeed in certain regions. Genre popularity reveals itself through repeated viewing trends across countries. Relevance duration for each title also appears clearly when measured over time. Displayed visually, the information lets staff explore details interactively during meetings. Newcomers grasp key points quickly, guided by dynamic dashboards [5]. Behind these views sit systems designed to turn raw data into clear summaries.

1.3 Role of Power BI in User Behavior Analysis

Most people choose Power BI (Business Intelligence) [4] because it combines sorting raw information, cleaning it, yet also turning it into clear visuals within a single environment.

Within this system, individuals create interactive dashboards - selecting a chart element adjusts related displays instantly. Instead of fixed reports, they examine figures dynamically, changing perspectives, filtering segments, even broadening groups as needed. Such flexibility shapes how groups uncover insights hidden behind overall summaries. Every interaction reflects actual decisions taken when moving through details easily overlooked initially.

In this work, Power BI is used to:

- Clean and reshape data with Power Query
- Model data relationships using a star schema
- Design interactive dashboards for examination of patterns
- Visualize trends related to content distribution and user preferences

1.4 Objectives of the Research

The main goals of this research are:

- To study Netflix content spread through live-updating dashboards: Human behavior emerges when reviewing story types chosen, ratings given, alongside whether titles are series or movies.
- To identify trends in content by country and year of release
- One way to see how well Power BI works is by exploring its visual reports. Through real examples, the software reveals patterns clearly. Using dashboards helps users grasp trends quickly. Instead of spreadsheets, interactive charts tell stories differently. Each feature supports decision making without extra steps. Seeing data shift live builds stronger insight naturally.

LITERATURE REVIEW

Most past work around streaming services looks at what kinds of shows people pick, age-based labels, or where they live - each shaping how users interact [2]. When it comes to Netflix, analysts lean on open data sources that reveal

patterns across titles. Though algorithms can forecast certain results, visual reporting systems let teams see insights more clearly, guiding choices behind the scenes. Understanding viewer habits ties back not just to prediction models but also simpler tools making sense of complex details.

2.1 Studies on OTT Platforms and User Behavior

- Multiple studies have looked at the evolution of OTT platforms and their effects on viewing habits [2]. Research indicates that flexibility, personalization, and on-demand access are the reasons why users adopt OTT services. Genre preference, maturity ratings, and regional access are major factors that allow users to engage with the platform.
- Studies focusing on user behaviour analysis often rely on metadata like content categories, ratings, and release dates to interpret viewing patterns. Findings show that genres such as drama, documentaries, and crime attract more viewers. Additionally, mature-rated content dominates OTT platforms [8], indicating a shift toward more complex and adult-themed storytelling.

2.2 Netflix-Centric Analytical Studies

- Netflix has often been studied by researchers because information about its content datasets is publicly available and easy for academics to access and analyse. Various studies have analysed the Netflix Titles dataset to discover trends in genre distribution [10], content growth over time, and production patterns by country. These studies highlight the fact that most of the content available on Netflix comes from the United States [9] while countries like India and the United Kingdom are also the emerging participants in contributing content.
- Some researchers have applied machine learning techniques to Netflix data for recommendation systems and predicting user patterns. While these methods offer detailed

knowledge about the data, they typically require complex models and technical skills. On the other hand, approaches that use charts, graphs [6], business intelligence tools make it easier to explore and understand information, especially in academic environments.

2.3 Role of Data Visualization and Business Intelligence Tools

- When dealing with large, jumbled sets of facts, images often help more than words. Rather than static pages filled with numbers, animated graphs [6] and real-time screens make it easier to notice trends, connections, or strange details quickly. What stands out visually tends to stick in the mind longer. Seeing shifts happen over time reveals what raw columns cannot show alone.
- Here's why some tools feel different: they clean chaos into clarity, even as visuals form. Streaming services notice when certain stories travel - thanks to dashboards that catch drifts between places. Screens shaped right reveal patterns hidden before. Tools like Tableau [4] or Power BI turn noise into clear signals, outpacing outdated ways of reading data. Faster understanding means fewer blind spots in picking what gets made next.

2.4 Research Gap

- Research into streaming services usually relies on data numbers or smart algorithms. Still, among college projects, visual reports built with business intelligence software stay rare. Many studies fixate on films or old-school TV programs instead. Web-based series tend to miss attention - things such as how many episodes exist, storylines across seasons, or which studios back them. Most folks skip these angles. Left-out bits stick around, especially when research blends Netflix show facts with info from elsewhere. Because of that hole, what we learn about binge-watching stays thin. The view just doesn't go deep enough.
- Most dashboards showing user behavior

draw from just one place. When info stays split, spotting trends becomes a guessing game. Seeing how people really watch takes more than isolated numbers. Puzzles form when different records don't connect. Clearer pictures fade if logs stay separate. Most efforts never tie what people watch to how a show looks on screen. Yet, spotting that pattern might explain things raw numbers simply miss.

- Presenting a clear, visualization-driven approach that is suitable for academic evaluation

This research shows how business intelligence and data visualization [4] techniques can be effectively applied to OTT platform analytics, making it relevant and useful in both academic and practical contexts.

DATASET DESCRIPTION AND METHODOLOGY

2.5 Contribution of the Present Study

This study addresses the identified gaps by:

- Using Power BI to create interactive dashboards for Netflix analytics
- Merging Netflix Titles data with a focused web series dataset
- Analysing content trends across genres, ratings, countries, and release years

This study uses two datasets: the Netflix Titles dataset, which contains 4,529 records, and an additional web-series dataset [10]. Data cleaning and transformation were done using Power Query. A star schema was used for data modelling, and we created interactive dashboards [5] in Power BI following the data analytics process.

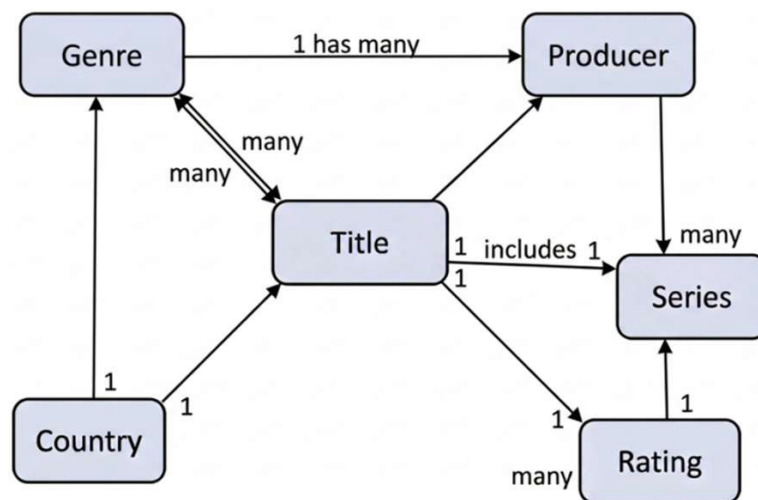


Figure 1: Star Schema data model used for analysis

3.1 Dataset Description

structured datasets that together help study Netflix content trends and user behavior.

The analysis in this research relies on two

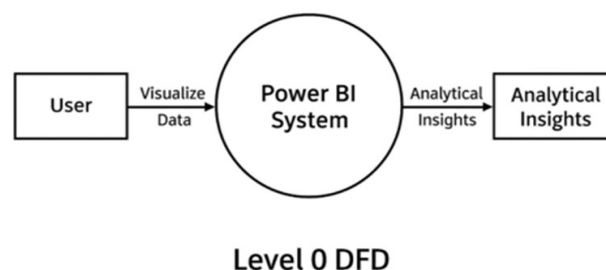


Figure 2: Level 0 Data Flow Diagram of the system

Publicly available dataset of Netflix titles created by Shivam Bansal on Kaggle (2020) [10]. The dataset includes attributes such as:

- Title - Movie/ TV series titles or names are provided
- Content Type- It describe what is the type of content a user is watching (Movie or TV

- Director- who is the director of the movie or TV show
- Cast- who is the cast playing in movie or TV show
- Country of Production- the origin country where the shooting has been done or produced
- Release Year- The releasing year of the movie or TV show.
- Maturity Rating- in what maturity category does it Fit (TV-MA, TV-14)
- Duration- running time of a movie or TV show
- Genre- what genre does it depict or suits

[illegible]

Figure 3: Dataset of Netflix titles

The web-series dataset includes:

- **Series Name**- name of the series user watched or wants to watch
- **Number of Seasons**- total number of seasons a particular series have
- **Number of Episodes**- total number of episodes in a series (including all season)
- **Producer**- name of producer who produced the series
- **Primary Genre**- it tells that a particular series belong to which genre.
- **Origin Country**- tells the country where series is shot or produced

3.1.2 Web-Series Metadata Dataset

To broaden the analysis beyond basic title information, we included a supplementary web-series dataset. This dataset focuses on attributes that relate to viewing habits for episodic content. Web Series Dataset is a custom dataset prepared for academic & demonstration use.

- Series Rating- IMDB rating of a series
- Release Year- releasing year of the series.
- Location- this includes longitude and latitude of the origin country
- Popularity- this tells us how popular a particular series is

series_id	series_name	total_seasons	total_episodes	producer	language	Genre	rating	released_year	origin_country	longitude	latitude	popularity
S001	The Vampire Diaries	8	171	Julie Plec, Kevin Williamson	English	Drama, Supernatural	8.2	2009	United States	-95.7123	37.0902	High
S002	The Originals	5	92	Julie Plec, Michael Narducci	English	Horror, Fantasy	8.2	2013	United States	-95.7123	37.0902	Medium-High
S003	Legacies	4	68	Julie Plec, Brett Matthews	English	Drama, Fantasy	7.4	2018	United States	-95.7123	37.0902	Medium
S004	The Witcher	4	32	Lauren Schmidt Hissrich	English	Action, Fantasy	8.1	2019	United States / Poland	-95.7123	37.0902	High
S005	Lucifer	6	93	Tom Kapinos	English	Fantasy, Crime, Comedy	8.1	2016	United States	-95.7123	37.0902	High
S006	Manifest	4	62	Jeff Rake	English	Mystery, Drama, Sci-Fi	7.1	2018	United States	-95.7123	37.0902	Medium-High
S007	Riverdale	7	137	Roberto Aguirre-Sacasa	English	Teen Drama, Mystery	6.5	2017	United States	-95.7123	37.0902	High
S008	Freaky	1	8	Victoria Schwab, Emma Roberts	English	Romance, Fantasy	6.4	2022	United States	-95.7123	37.0902	Medium
S009	Insatiable	2	22	Lauren Gussis	English	Dark Comedy	6.5	2018	United States	-95.7123	37.0902	Medium
S010	The Midnight Club	1	10	Mike Flanagan	English	Horror, Mystery	6.5	2022	United States	-95.7123	37.0902	Medium
S011	Never Have I Ever	4	40	Mindy Kaling, Lang Fisher	English	Teen, Comedy, Drama	8	2020	United States	-95.7123	37.0902	High
S012	My Life with the Walter Boys	1	10	Melanie Halsall	English	Drama, Romance	7.3	2023	United States	-95.7123	37.0902	Medium
S013	Friends	10	236	David Crane, Marta Kauffman	English	Sitcom, Comedy	8.9	1994	United States	-95.7123	37.0902	Very High
S014	Ginny & Georgia	2	20	Sarah Lampert	English	Comedy, Drama	7.5	2021	United States	-95.7123	37.0902	High
S015	Gossip Girl	6	121	Josh Schwartz, Stephanie Savage	English	Drama, Teen	7.4	2007	United States	-95.7123	37.0902	High
S016	10. Kitty	1	10	Jenny Han	English	Romantic Comedy	6.6	2023	United States / South Korea	127.7669	35.9078	Medium
S017	Adolescence	1	10	Ashley Avis	English	Drama	5.8	2018	United States	-95.7123	37.0902	Low
S018	Mismatched	2	14	Akash Khurana	Hindi	Romantic Comedy	6.9	2020	India	78.9629	20.5337	High
S019	Anne with an E	3	27	Maria Vallety-Beckett	English	Drama, Historical	8.7	2017	Canada	-106.3466	56.1304	High
S020	True Beauty	1	16	Kim Sang-hyub	Korean	Romance, Comedy	8	2020	South Korea	127.7669	35.9078	High
S021	Young Sheldon	7	141	Chuck Lorre Productions	English	Comedy, Drama	7.7	2017	USA	-95.7123	37.0902	High
S022	The Big Bang Theory	12	279	Chuck Lorre Productions	English	Comedy, Romance	8.1	2007	USA	-95.7123	37.0902	Very High
S023	The Royals	4	40	Lionsgate Television	English	Drama, Romance	4.4	2015	UK/USA	-3.435973	55.378051	Low
S024	Boo, Bitch	1	8	Crazy Cat Lady Productions	English	Comedy, Fantasy	6.4	2022	USA	-95.7123	37.0902	Medium
S025	My Demon	1	16	Studio Dragon	Korean	Romance, Fantasy	7.6	2023	South Korea	127.7669	35.9078	High
S026	Hidden Love	1	25	Youku	Chinese	Drama, Romance	8.6	2023	China	104.1954	35.8617	High
S027	Suits	9	134	Universal Content Productions	English	Legal, Drama	8.4	2011	USA	-95.7123	37.0902	High
S028	Stranger Things	4	34	21 Laps Entertainment	English	Drama, Fantasy, Horror	8.6	2016	USA	-95.7123	37.0902	High
S029	Queen of Tears	1	16	Studio Dragon	Korean	Romance, Drama	8.2	2024	South Korea	127.7669	35.9078	High

Figure 4: Web-series dataset

This dataset allows for insights into binge-watching patterns, preferences for series length, and how producers impact content popularity.

3.2 Tools and Technologies Used

The following tools and technologies helped implement the analytical framework:

- Power BI: For creating dashboards and visualizations [4]
- Power Query: For data cleaning and transformation [4]
- DAX (Data Analysis Expressions): For creating calculated measures
- Microsoft Excel: For initial dataset inspection
- Windows Operating System: For running the analysis

These tools were chosen to ensure efficient data pre-processing, modelling, and visualization within a streamlined workflow.

3.3 Methodology Adopted

Fresh insights begin when raw numbers move through clear steps. Each stage links to the next, building understanding without skipping details.

3.3.1 Data Collection

Out in the open, data came from public spots

- two batches matching figure 3, others like those in figure 4. These landed inside Power BI using its standard import path. A quick glance followed, just to see if columns matched up across spreadsheets. Nothing moved ahead until each piece of every set was verified in place

3.3.2 Data Understanding

Looking through the data sets, patterns could be spotted right away. A closer look showed certain trends standing out more than others. From that point onward, the analysis began to yield progressively coherent insights. Emerging patterns prompted further inquiry, which in turn informed subsequent directions of investigation. This iterative process ultimately contributed to the development of a more comprehensive understanding of the data.

- Missing or null values
- Duplicate entries
- Inconsistent formatting
- Multi-valued fields like genres and countries

Consequently, it became evident which data preparation techniques were essential for effective analysis.

3.3.3 Data Cleaning and Transformation

Power Query handled the clean-up of messy information. Cleaning up began by reshaping number rows into clearer formats. Through this

step, odd labels turned into consistent headers. Where gaps showed up, they got filled using nearby values. Duplicates were tossed aside without hesitation. Each column then shifted to match correct types - text stayed text, numbers acted like numbers. Before moving on, unwanted parts vanished quietly. Smooth transitions followed, linking pieces together behind the scenes. What emerged was ready for what came next.

- Removal of duplicate records
- Handling missing values by replacement or exclusion
- Splitting of multi-valued columns
- Standardizing date formats

3.3.4 Data Modelling

A main table ties into categories like genre, score, nation, also maker, setting the layout we built on. Speed improved when searches got sharper, while visuals narrowed better.

3.3.5 Dashboard Development

A dashboard came together through hands-on design work powered by Power BI tools. Visual pieces took shape - each built using methods tailored for clarity and interaction

- Cards for summary metrics
- Bar and column charts
- Donut charts
- Line graphs for trends over time
- Geographic maps
- Filters and slicers for user interactions

3.3.6 Insight Generation

Patterns on dashboards started revealing shifts over time. As genre gaps caught attention, links to what viewers picked came into view. When content types switched, rating movements followed - particularly noticeable with longer observation. Country details mixed with launch years brought a key point forward. Category divides alone didn't show it, but broader contrasts made preferences visible.

Our methodology ensures organized data

flow shapes clear visuals, then leads to precise insights. Through blending BI methods alongside live-updating dashboards, the research builds a flexible path for studying streaming platforms. Not rigid, but responsive.

RESULTS AND DISCUSSION

Most Netflix's shelves comes from movies. Yet its TV shows and online series that keep viewers sticking around longer. Documentaries pull in steady interest, just like emotional dramas and stories filmed abroad. Content meant for adults - rated TV-MA or TV-14 - pops up again and again. From country output, two stand tall: the U.S. leads, but India follows close behind. When it comes to web-based episodes, tight plots matter more than run time.

Figures 5 and 6 show the interactive dashboard built in this work:

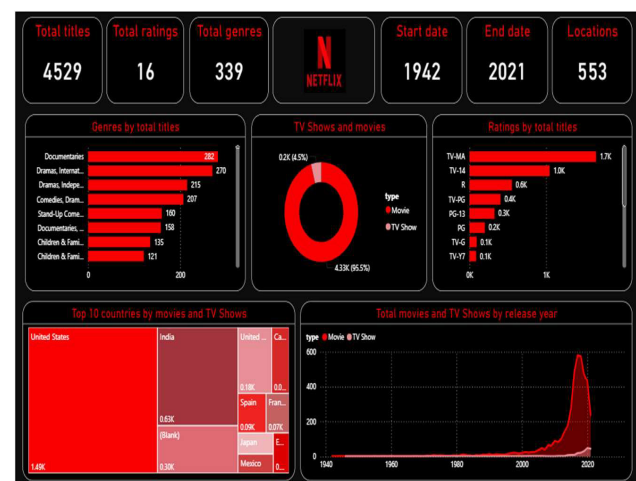


Figure 5: Dashboard on Netflix titles analysis

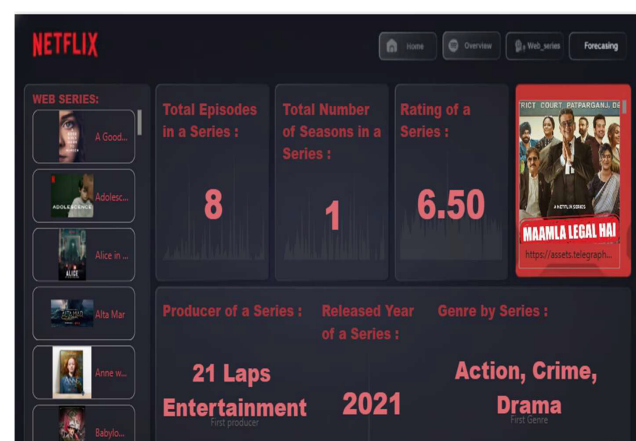


Figure 6: Web-series analysis dashboard

4.1 Overview of Analytical Findings

- The results in this section come from interactive dashboards created using Power BI [4], which allow the studying of Netflix content information from different angles to better understand patterns, trends and different types of shows and movies available on the platform. The dashboard helps in exploring the information by allowing users to filter content by type, genre, maturity rating, country of origin, and release year.
- This discussion interprets observed trends and connects them to inferred user behaviour analysis on OTT platforms.

4.2 Content-Type Distribution

- The analysis of content-type distribution shows that movies clearly dominate the Netflix library over television shows. Movies make up most titles, suggesting that feature-length content remains a crucial part of Netflix's content collection.
- Although TV shows and web series form a smaller part of the dataset, they help keep viewers engaged because people watch multiple episodes. This shows that Netflix offers many movies while also investing in series to keep subscribers interested.

4.3 Genre-Based Analysis

- Looking closer at types of shows, docs pop up a lot alongside serious stories, funny ones, plus films from outside the US. Mixing these kinds together seems to be how Netflix keeps viewers hooked - shifting tones like changing lanes on a long drive. A drama with laughs here, a foreign film spliced with real-life tales there - it adds up without trying too hard
- Looking at how people watch, it turns out dramas and documentaries get lots of attention because folks like real tales and learning something new. Earlier research saw the same thing - mixing up what's offered helps keep users tuned in when they stream

online.

4.4 Maturity Rating Trends

- Most shows on Netflix carry a TV-MA or TV-14 label, pointing to programming built for older teens and adults. Content shaped for mature viewers clearly takes up the largest share of what's offered
- Fewer kids' shows suggest Netflix leans into grown-up narratives. Over time, what people want has shifted - complex plots about actual societal matters now draw bigger audiences online. Stories with depth are gaining ground where simpler ones once ruled.

4.5 Country-Wise Content Contribution

- Out west, a map lights up brightest where American shows pile high in Netflix's collection. Next comes India - its glow growing, tied to home grown stories finding space on the platform. This shift traces back to decisions made far from Hollywood, reaching toward local voices.
- Across many nations, shows appear in different forms - proof that Netflix shapes its offerings for local tastes. Because of this, more people around the world find something familiar. Reaching wider groups happens naturally when stories reflect real lives

4.6 Release-Year Trend Analysis

- Lately, more stuff has been made than ever before - that jump stands out once you pass 2015. Around then, Netflix started spreading worldwide while spending bigger on shows they create themselves
- Streaming platforms now favour stories told in episodes, drawing people in over time instead of all at once. A slow build keeps viewers coming back, not just clicking once. This way, attention sticks around longer than it did before. Patterns show that one episode after another works better than single moments alone

4.7 Web-Series Behaviour Analysis

- Viewers tend to stick with web series that wrap up early - most hits last just one to three seasons. Because of this pattern, shorter storylines seem more appealing than drawn-out ones. A clear trend appears when checking the data: simplicity wins attention. Instead of endless episodes, people favour focused plots that move quickly. Story length matters more than expected.
- Story types like crime, thrillers, or intense dramas show up often online. Fast plots with clear direction seem to grab attention easily. One name popping up again and again behind top shows suggests consistency matters. Strong builds and trusted teams might just tip the balance when it comes to what sticks. What works tends to repeat - quietly, steadily.

4.8 Discussion of Results

- It turns out Netflix shapes its offerings around what people actually choose to view. Viewers' tastes clearly influence the volume of adult-focused material available. Drama holds steady, documentaries keep gaining ground. Instead of sticking to one format, longer stories told in parts are becoming more common. Shows made outside the U.S. appear more often now. What gets produced seems less about guesses and more about patterns in how audiences spend their time watching. Preferences shift, so does the catalog.
- Most folks find charts that respond to clicks simpler to follow, since sliding through layers of info reveals shifts over time. These live displays let people dig into streaming service stats without getting lost in spreadsheets. Instead of static reports, moving parts inside the screen show what viewers prefer week by week. Tools like these help teams spot jumps in demand before they become obvious. Seeing numbers shift with a toggle beats reading paragraphs about averages.

Flexibility here means fewer guesses when planning new shows.

CONCLUSION & FUTURE SCOPE

Through this study, we explored inside Netflix's collection started with plain numbers turned alive through Power BI visuals. Not only did we check the main movie and show line-up, but also pulled in extra web-based series details to see broader patterns. Movies make up most of what's offered - no surprise there - but it is long-running TV formats that hook people across weeks or months. Instead of quick hits, audiences lean toward layered stories: drama leads, followed closely by real-life tales in documentary form. At the same time, non-English material has grown fast, reaching far beyond one country's tastes. Who gets served? Mostly older teens and full-grown adults - the kind drawn to serious themes and complex characters. Far from just plotting lines and bars, this work reveals how visuals expose habits, moods, and shifts in watching behavior right now.

Looking ahead, there is much more to uncover by making the data even more responsive and personal. The next logical step would be to move away from static datasets and use APIs to feed real-time information into the dashboards, allowing the analysis to grow as the library does. We could also dive deeper into the "why" behind the numbers by looking at actual engagement metrics—like how often a user finishes a series or when they choose to hit pause—which would provide a much more intimate look at human behavior. There is also an exciting opportunity to use predictive modelling to guess what the next big hit might be, or to analyze social media chatter to understand the emotions behind the views. Finally, by bringing platforms like Amazon Prime and Disney+ into the mix, we can move beyond Netflix and understand the broader shifts in how the entire world watches television

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A Study on Assessment of Physiological and Psychological problems among women working from home

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ABSTRACT

The work-from-home (WFH) model has become increasingly prevalent, particularly among women, leading to significant changes in domestic space utilization and daily routines. Although working from home poses several physiological and psychological challenges due to prolonged screen time, inadequate workspace design, blurred work-life boundaries, and increased domestic responsibilities. The current investigation seeks to evaluate the physiological and the physiological and psychological problems experienced by women working from home. The study was conducted among 120 women respondents aged between 22 - 50 years, chosen through the use of purposive sampling. A systematic questionnaire was used to gather data, covering demographic profile, work-from-home conditions, physiological health issues, psychological well-being, and home workspace characteristics. Descriptive and inferential statistical tools were used for data analysis. Findings of the study are expected to highlight common physiological and psychological health concerns such as musculoskeletal pain, eye strain, mental stress, and work-life imbalance among women working from home. The research provides coping strategies, contributing to healthier and more supportive home-based work environments for women.

Keywords: Women working from home, physiological problems, psychological problems, Work-life balance

INTRODUCTION

Work from home (WFH), often known as teleworking or remote working, is a work arrangement where individuals use digital resources including computers, the internet, and communication devices to carry out their professional responsibilities from home (Chirico et al., 2021). When the COVID-19 epidemic struck, this type of work arrangement developed widely as companies used remote working to continue operations while maintaining safety. WFH offers a number of benefits, including more productivity, more work autonomy, shorter commutes, and flexible working hours. Women particularly benefit from it since it enables them to manage duties to family and work (Schur et al., 2020).

WFH offers benefits, but it has also brought about a number of health issues. Without the right ergonomic setup, women who work from home frequently spend long hours in front of computers, which can cause physiological issues like musculoskeletal discomfort, exhaustion, eye strain, and sleep disturbances. According to a study, teleworkers' distant working circumstances resulted in musculoskeletal pain, decreased

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physical activity, and poor sleep quality (Chirico et al., 2021).

WFH affects mental health in addition to physical health issues. Due to their workload, household duties, and lack of work-life boundaries, women who work from home feel more stressed out. Anxiety, sadness, and psychological distress are further exacerbated by social isolation, a lack of organizational support, and work-family conflict (Oakman et al., 2020). According to de Macêdo et al. (2020), workspace features including shoddy furniture, insufficient lighting, and a lack of privacy might exacerbate physical and mental health issues. In order to improve the health and well-being of women who work from home, it was crucial to investigate the psychological and physiological issues they face.

1.1 Objectives of the Study

1. To determine the physiological issues that women who work from home face such as musculoskeletal discomfort, eye strain, fatigue, and sleep disturbances.
2. To identify the psychological problems faced by women working from home such as stress, anxiety, depression, irritability, and work-life imbalance.
3. To study the influence of home workspace characteristics such as furniture, lighting, ventilation, noise, and privacy on physiological and psychological health.
4. To suggest coping strategies to improve physical and psychological well-being among women working from home.

REVIEW OF LITERATURE

A theoretical and empirical basis for comprehending the physiological and psychological issues faced by women who work from home is provided by the literature review. Researchers have concentrated on analysing the impact of working remotely on employees' physical and mental health, work-life balance, and general well-being due to its growing popularity,

especially since the COVID-19 epidemic.

2.1 Theoretical Review

2.1.1 Work Life Balance Theory

The connection between people's personal and family roles and their professional obligations is explained by the equilibrium among work and life idea. According to the hypothesis, role conflict, stress, emotional strain, and decreased psychological well-being result from professional expectations interfering with personal and family life. According to Greenhaus and Beutell (1985), work-family conflict arises when expectations from one position make it impossible to participate in another. The physical and psychological lines separating the business and family spheres are frequently blurred when working from home, which raises the risk of role overlap and overload. According to the work-family border hypothesis, poorly managed boundaries between personal and professional domains can have a detrimental impact on people's general well-being and level of life satisfaction (Clark, 2000). As a result, striking a balance between work and personal obligations has grown in importance, especially for women who are juggling several jobs at home. Women who work from home are more susceptible to work-life imbalance since they must juggle both their personal and professional obligations. Emotional weariness and psychological stress are increased by this overlap. According to Galanti et al. (2021), there was a substantial amount of work-family conflict among distant workers, which had a negative impact on their mental and general well-being. The notion emphasizes that minimizing psychological issues among women who work from home requires striking a balance between job and personal life.

2.1.2 Ergonomic Theory

In order to improve comfort, efficiency, safety, and productivity, ergonomic theory highlights the significance of creating work settings that take into account each person's physical capabilities and limitations. In order to reduce physical strain during job activities, proper ergonomic design incorporates the use of appropriate furniture,

sufficient lighting, proper working posture, and well-organized workspace arrangements. Grandjean (1987) asserts that ergonomics seeks to prevent pain and occupational health issues by adjusting the workplace to human needs. However, many people work from home in environments that are not ergonomically planned, frequently utilizing inappropriate furniture and incorrect workstation configurations. Physiological issues such as musculoskeletal disorders, neck and back discomfort, eye strain, and physical exhaustion may be exacerbated by such poor ergonomic settings (Dul & Weerdmeester, 2008). These issues underscore the significance of ergonomic interventions in home-based work settings to promote health and wellbeing, especially for women who manage extended work hours from home. Poor ergonomic circumstances, such as inappropriate seating and inadequate workspace design, greatly raise the risk of physical pain and occupational health issues, according to De Macêdo et al. (2020). According to this notion, women who work from home have physiological health problems as a direct result of improper workstation settings.

2.1.3 Occupational Stress Theory

Occupational stress theory explains how demands and strains at work affect people's physical and mental health. The theory states that stress arises when an individual's capacity or resources are insufficient to meet the demands of their job. Physical exhaustion, mental depletion, anxiety, and decreased job performance can be caused by prolonged exposure to a heavy workload, time constraints, role conflict, and a lack of control over working environment. Uncertain work boundaries, a heavier burden, and juggling work and home obligations at the same time can all contribute to occupational stress when working from home, which can have an adverse effect on general wellbeing (Lazarus & Folkman, 1984; Cooper & Marshall, 1976). Women who work from home frequently deal with a heavier workload, longer workdays, less organizational support, and disruptions from family obligations. Increased stress, worry, and mental exhaustion are caused by these circumstances. According to Magnavita et al. (2021), teleworking led

to a greater burden and a less distinct division between work and personal life, which in turn raised occupational stress. This theory offers a framework for comprehending the psychological issues related to remote labor.

2.2 Empirical Review

The physiological and psychological impacts of teleworking and working from home have been the subject of several research investigations. According to de **Macêdo et al. (2020)**, who looked at the effects of ergonomic workspace conditions on teleworkers, poor workstation design was a major factor in musculoskeletal pain, physical strain, and elevated stress levels. The study underlined how crucial ergonomic arrangements are to preserving employees' wellbeing and output. In a similar vein, **Moretti et al. (2020)** investigated how remote work affected employees' physical health and discovered that extended sitting and bad posture led to more neck and back pain as well as general physical discomfort. The study emphasized the importance of ergonomic workstation design in averting physiological health issues. In their analysis of the health effects of working remotely, **Oakman et al. (2020)** found that both physiological and psychological problems were caused by poor workspace design, decreased physical activity, and increased workload. The findings demonstrated a strong link between musculoskeletal pain, exhaustion, and poor ergonomic circumstances. Numerous investigations into the health effects of teleworking were conducted in 2021. In a methodical investigation of the impact of teleworking on mental and physical health, **Chirico et al. (2021)** discovered that musculoskeletal discomfort, exhaustion, remote workers frequently had decreased physical activity, weight gain, and poor sleep quality. Psychological problems like stress, worry, depression, and a decline in job satisfaction were also frequently reported. **Afonso et al. (2021)** discovered that remote workers had greater levels of anxiety, depression, and sleep issues in their investigation of the psychological effects of teleworking. Afonso et al. (2021) found that distant workers experienced higher levels of anxiety, sadness, and sleep difficulties.

The study found that two of the main causes of psychological suffering are social isolation and work overload. In their investigation of occupational health difficulties among distant workers, **Ekpanyaskul and Padungtod (2021)** noted psychological problems such stress, anxiety, and work-life imbalance in addition to physiological concerns like weight gain, neck pain, and back pain. Similarly, **Galanti et al. (2021)** examined the relationship between remote work and mental health and discovered that social isolation and work-family conflict were strong predictors of increased stress and decreased psychological well-being. According to the research evaluation, working from home significantly affects a person's emotional and physical well-being. Extended periods of sitting and poor ergonomic circumstances are frequently linked to physiological issues such as musculoskeletal pain, exhaustion, eye strain, and sleeping disturbances. Stress, anxiety, sadness, and work-life imbalance are common psychological issues, especially for women who typically juggle additional family obligations with their professional professions. Features of the workplace have a substantial effect on people's overall health and wellbeing. Reducing health-related issues requires organizational support, ergonomic setups, and successful life at work strategies for balance. Consequently, the present investigation focused on assessing the Physiological and psychological problems that women who work from home encounter and generate methods to improve their health.

METHODOLOGY

A descriptive research methodology was used in this study to evaluate the physiological and psychological problems among women working from home. The descriptive approach was considered appropriate as it enables systematic examination of work-from-home conditions, health-related concerns, and work-life balance without manipulation of variables. A total of 120 women working from home were selected using a purposive sampling technique to ensure inclusion of participants actively involved in remote work. A standardized questionnaire designed for remote work was used to gather data, conditions,

physiological problems, psychological well-being, workspace characteristics, and coping strategies. The study included women aged between 22 and 50 years who have at least six months of experience working from home and regularly used computers or laptops for professional activities. Women not engaged in work-from-home arrangements, those working from home for less than six months, and individuals with pre-existing severe medical or psychological disorders were not included in the research. To evaluate the results, the gathered data were examined using suitable descriptive statistical techniques.

3.2 Data Collection Tool

A systematic questionnaire created by the researcher based on review of literature. The questionnaire consisted of the following sections:

1. Demographic Information comprised inquiries about family type, number of children, education, employment position, age, and marital status.
2. Work-From-Home Conditions which caters questions about, Duration of working from home; Availability of separate workspace; Privacy level
3. Physiological Problems which included questions related to Neck pain, Back pain, Eye strain, Headache, Fatigue, Sleep disturbances
4. Psychological Problems which included questions related to Stress, Anxiety, Depression, Irritability, Work-life imbalance
5. Work life Balance which includes questions related to overlapping work hours of professional life with personal life
6. Home workspace ergonomics which includes questions related to workspace conditions and ergonomics of furniture used while working, lighting and ventilation
7. Coping and Adaptation strategies which includes questions related to taking frequent

breaks and other strategies to reduce the stress.

Responses were measured using a Likert scale such as 3 pointer scale “Agree”, “Neutral”, “Disagree” and “Always”, “Sometimes”, “Never”

3.3 Data Collection Procedure

Women who work from home were given the questionnaire in order to gather data. Before any data was collected, the respondents were informed of the study's goal and given their consent. The respondents were assurances that their answers would be kept private and utilized exclusively for scholarly research.

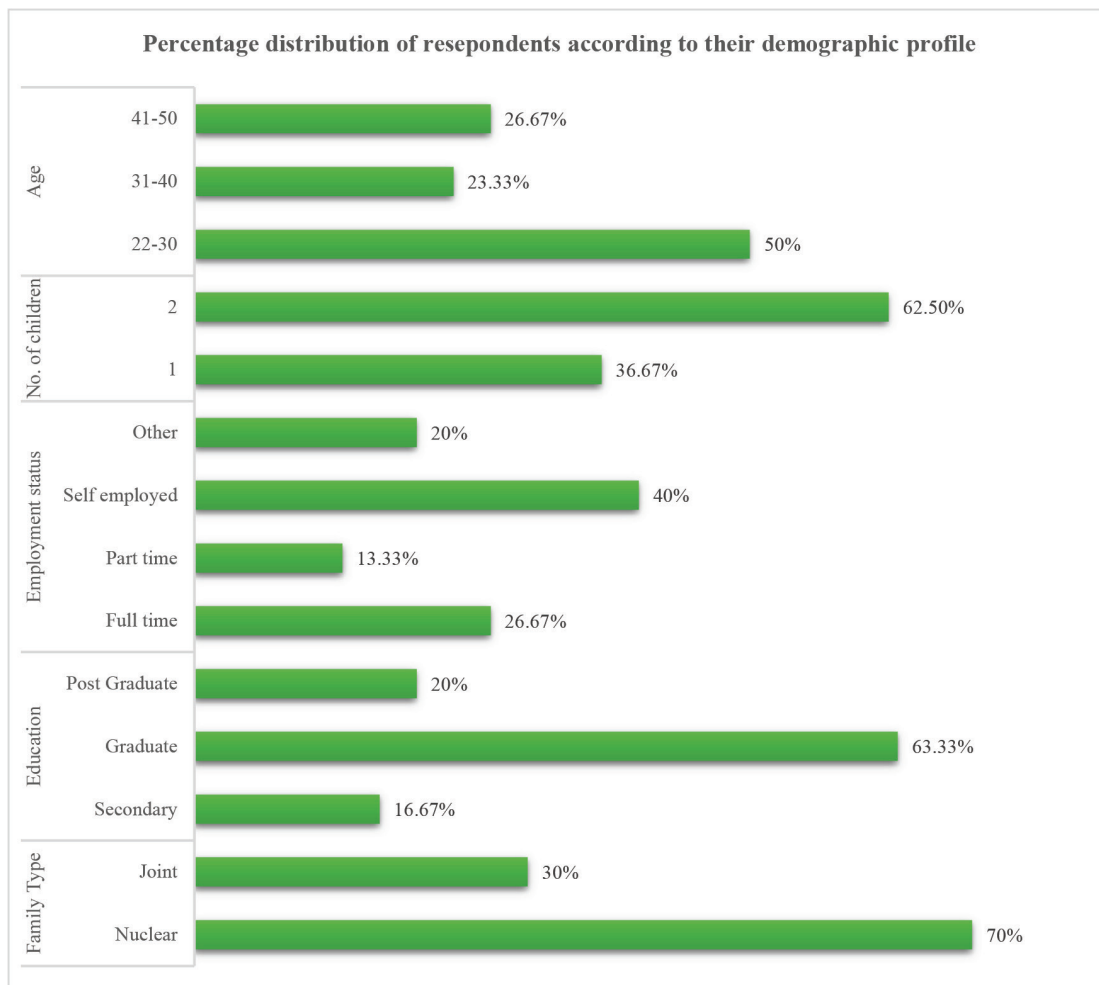
FINDINGS OF THE STUDY

The following parts include the study's

findings: demographic profile, work-from-home conditions, physiological problems, psychological problems, work–life balance, workspace ergonomics, and coping strategies.

4.1 Demographic Profile of Respondents

The results showed that half (50%) of the women who worked from home were between the ages of 22 and 30, while about one-fourth (26.67%) were aged between 40–50 years and nearly one-fourth (23.33%) were between 30–40 years. All participants (100%) were married. More than three-fifths (62.5%) had two children, whereas over one-third (36.67%) had one child. In terms of employment status, two-fifths (40%) were self-employed, followed by about one-fourth (26.67%) working full-time. Nearly two-thirds (63.33%) were graduates, and more than two-thirds (70%) belonged to nuclear families.



4.2 Extent of satisfaction among the respondents regarding their work from home conditions

Table 1: Extent of satisfaction among the respondents regarding their work from home conditions

Extent of Satisfaction	Range of Scores	(f)	(%)
Low extent of Satisfaction	10 - 16	12	10.0%
Medium extent of Satisfaction	17 - 23	28	23.33%
High extent of Satisfaction	24 - 30	80	66.67%

According to the results, almost two-thirds of the participants expressed a high degree of satisfaction with their remote work arrangements. 66.67% of respondents, or more than two thirds, have a high level of satisfaction. In contrast, only 10% of respondents had a poor level of satisfaction, while over one-fourth of respondents (23.33%)

indicated a medium level of pleasure. These findings imply that while a smaller percentage of women still report moderate to poor levels of satisfaction, the vast majority of women who work from home are content with their working conditions.

4.3 Extent of Physiological Problems among women working from home

Table 2: Extent of Physiological Problems among women working from home

Extent of Physiological Problems	Range of Scores	(f)	(%)
Low Extent of problems	10 - 16	8	6.67%
Medium extent of problems	17 - 23	52	43.33%
High extent of problems	24 - 30	60	50%

The results showed that individuals frequently experienced physiological issues. Less than half (43.33%) of the respondents fall under the medium level of physiological problems, and less than one tenth (6.67%) of the respondents

show low level of physiological problems. Fifty percent of the respondents reported high levels of physiological problems. These imply that most women experience physiological issues when working from home.

4.4 Extent of Psychological Problems among women working from home

Table 3: Extent of Psychological Problems among women working from home

Level of Extent of Psychological Problems	Range of Scores	(f)	(%)
Low Extent of problems	11 - 18	4	3.33%
Medium extent of problems	19 - 25	68	56.67%
High extent of problems	26 - 33	48	40%

The study found that women who work from home had significant psychological issues. While working from home, more than half (56.67%) of the respondents had medium-level psychological issues, less than half (40%) had high-level

psychological issues, and fewer than 10% had low-level psychological issues. This suggests that the majority of respondents had psychological issues when working from home.

4.5 Extent of satisfaction of work life balance among the women working from home

Table 4: Extent of satisfaction of work life balance among the women working from home

Extent of satisfaction	Range of Scores	(f)	(%)
Low extent of satisfaction	8 - 13	76	63.33%
Medium extent of satisfaction	14 - 18	32	26.67%
High extent of satisfaction	19 - 24	12	10%

The results show that among women who work from home, two thirds (63.33%) have low levels of satisfaction with juggling work and personal life, slightly more than one-fourth (26.67%) have medium levels of satisfaction, and one tenth (10%) have high levels of satisfaction.

4.6 Extent of comfort among the respondents regarding the ergonomics of the home work space

Table 5: Extent of comfort of the respondents regarding the ergonomics of their home work space

Extent of Comfort	Range of Scores	(f)	(%)
Low extent of comfort	8 - 13	4	3.33%
Medium extent of comfort	14 - 18	64	53.33%
High extent of comfort	19 - 24	52	43.33%

Regarding the ergonomics of the home workstation, the results revealed that slightly more than half (53.33%) of the respondents had a medium level of comfort, less than half (43.33%) had a high level of comfort, and very few had a low level of comfort. This suggests that the majority of women do not have a pleasant workspace at home.

4.7 Level of Coping and Adaptation Strategies adopted by Women Working from Home

Table 6: Level of Coping and Adaptation adopted by Women Working from Home

Level of Coping and Adaptation Strategies	Range of Scores	(f)	(%)
Low level of Coping and Adaptation Strategies	11 - 18	80	66.67%
Medium level of Coping and Adaptation Strategies	19 - 25	36	30%
High level of Coping and Adaptation Strategies	26 - 33	4	3.33%

The results show that, when working from home, more than two thirds (66.67%) of the respondents had low levels of coping and adaptation strategies, more than one fourth (30%) had medium levels, and less than one tenth (3.33%) had high levels.

To test the hypotheses formulated for the present investigation, as per the nature of variables coefficient of correlation were computed. For the purpose of statistical analysis, the hypotheses were formulated in null form. The results are presented in this section.

TESTING OF HYPOTHESES

HO1: There exists no relationship between the home workspace characteristics and the physiological and psychological wellbeing of respondents.

Table 7: Co-efficient of Correlation showing relationship between the home workspace characteristics and the physiological and psychological wellbeing of respondents.

Selected variables	n	R - Value	Level of significance
Home workspace characteristics	120	0.206	N.S.*
Physiological and psychological wellbeing of respondents.			
Note: N.S. * - Not Significance			

The findings showed that there is no relationship between the respondents' physiological and psychological wellbeing and the features of their home workstation. (Table 7). As a result, the null hypothesis was approved.

OUTCOME OF THE STUDY

The study emphasizes that although working from home offers convenience and flexibility, it also causes serious physiological and psychological problems for women. According to the research, most women suffer from physical health problems such as musculoskeletal discomfort, exhaustion, and eye strain as a result of extended workdays and unfavourable ergonomic settings. Because of the increased pressure and work-life imbalance, psychological issues like stress, worry, and mental tiredness are becoming very common. Women find it challenging to strike a balance between work and personal obligations, despite a high degree of satisfaction with work-from-home arrangements. Their general well-being is further deteriorated by unfavourable working conditions and a lack of coping mechanisms. According to the report, working from home offers freedom but also poses health and lifestyle issues.

A number of actions must be taken in order to enhance the wellbeing of women who work from home. Women should use comfortable furniture, keep good posture, and make sure their workstation has enough lighting and ventilation to promote optimum ergonomic arrangements. To preserve physical health, regular breaks, exercise, and less screen time

should be promoted. Stress-reduction strategies like meditation and relaxation techniques should be used for psychological well-being, and social engagement should be maintained to lessen feelings of loneliness. Work-life balance can be enhanced by setting clear boundaries between personal and professional life and adhering to set working hours. The pressure on women who work from home can also be considerably lessened by cooperation from family members in sharing household duties and help from employers in the form of flexible schedules and mental health programs.

CONCLUSION

According to the study's findings, most women who worked from home were young, married, educated, and juggling work and family obligations. Even while over two-thirds of the respondents expressed great pleasure with their work-from-home arrangements, a sizable portion also encountered difficulties linked to their health. High degrees of physiological issues, including pain, exhaustion, and discomfort, were reported by half of the respondents. In a similar vein, over half reported having moderate psychological issues, which suggests that stress, worry, and mental strain are present. About two-thirds of respondents expressed low satisfaction in juggling their personal and professional responsibilities, indicating that work-life balance was a significant worry. The majority of respondents reported just a modest level of comfort with workstation ergonomics, indicating unsatisfactory home work conditions.

Additionally, over two-thirds lacked adequate coping and adapting techniques. Overall, the results show that women who work from home confront significant physical, psychological, and work-life balance issues even though they are satisfied with flexibility.

IMPLICATIONS OF THE STUDY

The results of this study emphasize the significance of developing healthy and supportive work-from-home environments for women. The study emphasizes the need for ergonomically designed home workspaces with appropriate furniture, adequate lighting, ventilation, and proper posture arrangements to reduce physiological problems such as musculoskeletal discomfort, fatigue, and eye strain. The results also suggest that awareness regarding healthy work habits, including regular breaks, physical activity, and effective workspace organization, is essential for improving physical health and efficiency when working from home. The study further indicates the necessity of organizational and social support systems to help women maintain a balanced combining personal and professional obligations. Employers and institutions may encourage structured working hours, manageable workloads, and policies that promote work-life balance to reduce psychological stress and emotional exhaustion. The findings also provide useful insights for researchers, interior designers, and policymakers in formulating strategies, design guidelines, and actions designed to improve the general productivity and well-being of women working remotely.

RECOMMENDATIONS FOR FURTHER STUDIES

The following suggestions for further research are made in light of the study's limitations and findings:

- Similar larger sample sizes can be used in research.
- Comparative studies can be conducted between men and women.
- Studies can be conducted in different professions and regions.

- Longitudinal studies can be conducted to examine long-term effects.

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