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AI-driven digital marketing tools adopted by startups and traditional enterprises in Arunachal Pradesh, India.

Dr Minam Yomso,

Assistant Professor, Department of commerce, Jawaharlal Nehru College, Pasighat

Abstract.

The current study assesses and studies the level of adoption of AI-driven Digital Marketing Tools by the startups and traditional enterprises in Arunachal Pradesh, India. Given the pace of change in global marketing practices due to AI technologies, their adoption and adoption rates particularly in remote and infrastructure deficient areas are critically underserved. Employing a quantitative, cross-sectional study design, this study analyses existing acceptance levels, the primary organizational and technological drivers, and key deterrent factors and, succinctly, a measure of initial effect on business performance. For this purpose, primary data were collected via the structured questionnaires administered to 200 entrepreneurs (100 Startups, 100 Traditional enterprises) from key economic sectors in five major districts. The overall adoption is characterized by a moderate level with an (average 3.22/5), with a significantly greater inclination toward AI integration (Mean 3.85) among startups than traditional companies (Mean 2.60). Perceived Usefulness (β=0.42), Perceived Ease of Use (β = 0.36) and adequate Technical Expertise are among the important factors encouraging technology adoption, whereas Financial Cost (β = -0.19) is one of the dominant negative factors. This study confirms key hypotheses from previous research and presents significant region-specific conclusions for policy makers, business people, and digital marketers with specific suggestions that would make a difference in the integration of AI in inclusive and sustainable business development for Arunachal Pradesh. Keywords: AI-driven marketing, digital marketing innovations, startups, traditional enterprises, technology adoption, Technology Acceptance Model (TAM), Arunachal Pradesh.

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1. Introduction.

The emergence of digital platforms and data analytics has placed AI at the center of the new marketing paradigm as the most important disruptive technology. AI-based solutions — such as chatbots, advanced recommendation engines, predictive analytics, and hyper-personalized content generators — have become more essential to preserve a competitive advantage across the world (Chatterjee et al., 2021) Whereas adoption of AI is burgeoning with progress in advanced metro and technological locations, the penetration into remote, challenging, and culturally diverse places such Arunachal Pradesh (NE) raises different research questions related to the feasibility, acceptance, and efficacy of such a technology. Arunachal Pradesh serves as an interesting microcosm for this study. The state has a fledgling, if aggressive, ecosystem of start-ups eager to capitalize on digital capabilities to expand their market footprints, alongside established traditional enterprises thoroughly embedded in local customs and infrastructure realities. The difference between these two categories of organization, with respect to AI-driven marketing tools, is significant to understand. A gap analysis is critical to inform digital inclusion strategies, regional economic development, and entrepreneurial capacity building in under-serviced regions. Thus, this research endeavors to comprehensively assess the specific adoption patterns and enablers behind the adoption of AI-driven digital marketing tools for startups and traditional enterprises in Arunachal Pradesh, and to add an important regional contribution to the global technology adoption debate.

2. Review of Literature.

2.1 Theoretical Framework: Technology Acceptance Model (TAM). The theoretical framework for this study is Technology Acceptance Model (TAM; Davis, 1989). According to TAM, there are two core beliefs from which a person's decision to use a new technology is primarily derived:

- PU: A person believes that a specific system would improve his or her work performance.
- PEOU (Perceived Ease of Use): This refers to how much a person believes that doing something will go without4 effort.

The model is then expanded to include relevant organizational and contextual variables which are pertinent to specific (indirect) challenges in Arunachal Pradesh.

2.2 AI in Digital Marketing and Organisational Agility. AI technologies help in transitioning from conventional marketing to hyper-personalized engagement offering massive benefits to: predictive consumers; optimize campaigns; and increased ROI (Huang & Rust, 2021). Literature indicates that startups (which are characterized by a flat organizational structure, entrepreneurial leadership, and

attention on innovation) possess increased agility and faster technology adoption compared to traditional enterprises with established risk-taking tendency (Ransbotham et al., 2020; Vial, 2019).

2.3 Challenges in Context in Remote and Developing Regions. Enterprises living in remote or rural regions, like Arunachal Pradesh businesses, encounter specific and layered challenges (Patil et al., 2022). These include:

- Poorly supplied or inconsistent digital infrastructure (e.g. poor coverage and mobile connectivity).
- Lack of widespread technical skills and high digital illiteracy among the population.
- Large financial restrictions that make the purchase and maintenance of expensive AI software a big no-go.
- Geographic spread and linguistic differences also limit uniform digital engagement efforts.

3. Objectives and Hypotheses.

3.1 Objectives of the Study.

1. To determine the actual level of AI propelled digital marketing adoption among startups and traditional industry companies in Arunachal Pradesh.
2. To empirically find the technological (PU, PEOU) and organizational factors that significantly affect adoption decisions.
3. To assess in a structured way the key challenges and barriers between businesses in the journey of implementing AI marketing tools.
4. To draw evidence-based recommendations for government policymakers and industry practitioners to help improve AI's incorporation into the economy in the regional economic structure for regional purposes.

3.1 Hypotheses.

- H1: The AI-driven digital marketing tools adopted by startups show a significantly higher adoption rate against traditional enterprises.
- H2: TAM constructs (perceived usefulness & perceived ease of use) positively and significantly impact AI adoption.
- H3: In terms of AI adoption, most negative factors/barriers are the lack of digital infrastructure and limited technical know-how.

4. Research Methodology.

4.1 Research design and scope.

This is a descriptive and exploratory quantitative research design with a cross-sectional survey used. The focus of the study was to narrow the scope of this research into the business environment of five

important economic and administrative districts of Arunachal Pradesh i.e.,(Pasighat,Itanagar,Tawang, Bomdila and Ziro) as the study would be able to draw a sample of a small number of businesses in these districts that was relatively small but still representative of that of the state so as to gather enough sample sizes.

4.2 Sampling and Data Collection

- Sample size: N=200 business owners.
- Sampling: Stratified random sampling was conducted to obtain equal amounts of representation among the two organizations, the 100 Startups and 100 Traditional Enterprises.
- Instrument: A structured questionnaire was used, in which items were operationalized using multi-item Likert scales (ranging from 5-point scales, which have traditionally been adapted from well established technology adoption instruments, Venkatesh et al., 2003 and Davis, 1989). Demographics, AI Tool Use (frequency and extent, etc.), TAM constructs (PU, PEOU), Adoption Difficulties, perceived Business Performance Impact were all contained.

4.3 Data Analysis Techniques. The collected data were highly analyzed using SPSS 25.0 software. The techniques used were:

- Descriptive Statistics — To summarize demographic and adoption data.
- Independent Sample t-test: For testing H1 (difference in the means of the two groups).
- H2 and H3 Multiple regression analysis: to test H2 and H3 for predictability power and the direction of the hypothesized causes (PU, PEOU, Infrastructure, Cost, Expertise) for the dependent variable which is the AI Adoption Level.

5. Results and Findings.

5.1 Demographic Profile.

Variable	Category	Frequency (n=200)	Percentage (%)
Age	Below 30	80	40%
	31-45	70	35%
	Above 45	50	25%
Gender	Male	130	65%
	Female	70	35%
Type of Business	Startups	100	50%
	Traditional	100	50%
Key Sectors Retail, Tourism, Handicrafts, Education, Food Services			

Source:Field data analysed

5.2 Relation of AI Adoption Rates to others. And there was a glaring digital divide around:

- Startups: 65% have at least one AI marketing tool (social media automation, simple chatbots, etc.).
- Traditional Businesses: Only 35% utilized an AI-powered marketing tool.

5.3 Hypothesis Testing (H1: Independent Samples t-Test).

Comparison	Mean(Startups)	Mean(Traditional)	t-value	p-value.
AI Adoption Level (Scale 1-5)	3.85	2.60	5.91	<0.001

Source: *Source:Field data analysed in* ***SPSS Software***

Interpretation: The highly significant p–value (<0.001) confirms that there has been a statistically significant difference in AI adoption levels between the two groups. H1 is strongly supported. Startups have a much higher degree of AI integration.

5.4 Testing of proposed hypothesis (H2 and H3: Multiple regression analysis).

The regression analysis was conducted with the aim of investigating the effect of five Elements on level of AI diffusion.

Independent	Variable Standardized Beta (β) Coefficient	p-value
Perceived Usefulness (PU)	0.42	<0.01
Perceived Ease of Use (PEOU)	0.36	<0.01
Infrastructure Availability	0.31	<0.01
Technical Expertise	0.28	<0.01
Financial Cost	-0.19	<0.05

Source: *Source:Field data analysed in* ***SPSS Software***

Interpretation:

- Support for H2: Both Perceived Usefulness (β =0.42) and Perceived Ease of Use (β =0.36) are the best positive predictors of adoption, having higher statistical significance. Hypothesis H2 is well supported by the literature.
- Support for H3: Measured as positively related to adoption, the negative influence of both (Not having Infrastructure (inverse of Availability) and Unfamiliarity with technical matters (inverse to expertise)), respectively, proves to be significant impediments (β =0.31 and β =0.28 respectively) to the overall adoption. The only significant negative direct impact is financial cost (β = −0.19). Hypothesis H3 is supported.

5.5 Key Adoption Barriers (Difficulties). The most commonly reported major barriers in the entire sample were:

Challenges Statement	% of Respondents
Expensive AI tools and subscriptions	72%
Deprived of local skilled personnel/talent	65%
Poor and inconsistent internet connectivity	58%
Lack of perceived knowledge of specific AI technologies and vendors	55%

Source: *Source:Field data analysed in* ***SPSS Software***

6. Discussion and Conclusion.

6.1 Discussion.

The results reveal a substantial disparity in the digital capability in Arunachal Pradesh's business environment. In this domain of innovation, the validation of H1 is consistent with previous literature: organizational agility and less of a burden from legacy systems enable start-ups to become early adopters of disruptive technologies (Vial, 2019). Traditional businesses, on the other hand, encounter more significant issues of digital literacy and resistance to change. That perceived usefulness, as well as ease of use, is a significant driver of effectiveness, substantiates that this geographical context is well suited for the TAM model (Davis, 1989). Even in remote locations, the belief that AI will bring evidence of business effect is inescapable for the purpose of adoption of the technological invention. Most significantly, the barriers identified (for instance, cost, the workforce, and infrastructure) demonstrate that adopting AI in developing regions is not just a matter of willingness but is also an issue of access, affordability, and an enabling environment (Patil et al., 2022). In spite of these challenges the first adopters achieved material performance gains, from improved market understandings and improved conversion, confirming the excellent possibility of AI for regional growth.

6.2 Conclusion.

AI-enabled digital marketing in Arunachal Pradesh presents a significant potential to enhance competitiveness and sustainability within companies. Yet the extant digital divide — as the divergence in uptake between startups and traditional enterprises shows — requires targeted, multi-faceted action. By tackling the underlying barriers of financial outlay, absence of technical knowledge, and underdeveloped digital infrastructure, we can ensure that the positive impact of AI-based marketing trickles across every area of business in the region.

7. Implications and recommendations.

7.1 Implications.

- Academic: The paper offers empirical evidence that TAM's validity in a unique remote and developing-region context is significant.
- Policy: Points out the immediacy of the need for specific, differentiated policy measures to bridge the startup/traditional enterprise technology space.
- Business: Exhibits an explicit ROI outlook for adopting AI, which will move investment to where existing infrastructure allows.

7.2 A few recommendations to promote broader AI adoption

- Policy Makers (Government and IT Department)
    - Investment in Digital Infrastructure: Make investing in higher-speed fiber and 5G/satellite broadband deployment in district and sub-district commercial centers the primary priority.
    - AI Subsidy Schemes: Implement government-funded pilot programs for conventional small business teams to promote the adoption of local AI tools (e.g., regional language chatbots) through subsidized pilot programs or financial incentives.
- Training institutions and universities:
    - Focused Skill Development – Offer certified, applicable short courses on AI-in-Marketing instruments (predictive analytics, social media AI, prompt engineering, etc.) for current entrepreneurs.
- Businesses (Particularly Traditional Stakeholders):
    - Low Cost Integration: Start with low cost, high impact instruments (i.e., free/freemium AI content generators and simple website chatbots) to get them all in the know and given confidence before a big investment.
    - Cooperation: Create regional clusters or partner with local tech startups to offer technical support and domain-dependent custom solutions.

8. Limitations and Future Research

8.1 Limitations

- **Geographic Focus:** The analysis was narrow to 5 major districts, and a statewide census or a broader multi-district study is needed to fully generalize the findings.
- **Methodology:** The quantitative nature provided strong correlational data, but limited in-depth insight into the behavioral and perceptual subtleties that drove traditional enterprises and organizational resistance to change.

- **Cross-Sectional Design:** This study adopts an approach to measuring adoption at a single point in time and is not able to trace how adoption evolves or the long-term effect on business performance.

8.2 Future Research

- **Analysis:** Future qualitative studies should use qualitative methods (i.e., in-depth interviews) to investigate cultural, organizational resistance and detailed decision-making processes, especially among traditional enterprises.
- **Sector-Driven Analysis:** Studies can investigate sector-level AI adoption patterns (e.g., tourism versus handicrafts) to gain understanding and discover subtleties and particular high return use cases.
- **Longitudinal work:** Longitudinal work covering multiple years would be highly informative for tracking the trend of AI adoption, long-lasting economic growth and impact as well as effectiveness of policy changes.

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