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TRANSFORMING PILGRIMAGE TOURISM THROUGH DIGITALISATION – ANALYSIS OF TECHNOLOGICAL INTERVENTIONS AND USER EXPERIENCES IN THE MAJOR PILGRIMAGE SITES OF ASSAM

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Abstract:
This research explores the dynamic intersection of digital innovation and pilgrimage tourism in Assam's major pilgrimage sites. Through a comprehensive analysis, it investigates the varied technological interventions shaping this transformation, scrutinizes user experiences within this digital landscape, and assesses the socio-economic impact of these advancements. The study will give a brief idea about technological integration in pilgrimage sites, encompassing factors such as mobile applications, virtual reality experiences, informational kiosks, and online platforms for donations and information dissemination in the major pilgrimage sites of Assam. The study also highlights the effects on the management of pilgrimage sites, assessing the efficiency of digital tools in tasks like crowd control, resource management, and preservation of cultural heritage. The study employs a mixed-methods approach, combining surveys, interviews, and observational analyses to comprehensively assess the current state of digital adoption and its consequences.
The outcome of the paper will create a positive impact and bring an awareness for the contribution to the broader understanding of the interplay between tradition and technology in sacred spaces and can serve as a template for other regions grappling with similar dynamics, guiding policymakers, technology developers, and religious authorities in creating a harmonious balance between modernization and the preservation of cultural and spiritual values. Method of data collection will be primary and secondary based on interpretation which will be both qualitative and quantitative analysis method through observations, documents, survey and telephonic interviews with the help of simple random and mostly convenience sampling.
Keywords: Pilgrimage Tourism, Digital transformation, Technological intervention, User experience

INTRODUCTION

Pilgrimage tourism, as a significant segment of the global travel industry, has witnessed a remarkable transformation in recent years. This transformation has been driven by the rapid advancements in digital technologies, which have significantly impacted the way pilgrims plan, experience, and share their journeys. In the context of Assam, a state with a rich tapestry of religious traditions and numerous pilgrimage sites, digitalisation has the potential to revolutionize the pilgrimage experience for both domestic and international travellers.

This research paper aims to explore the role of digitalisation in transforming pilgrimage tourism in Assam. Specifically, the study will analyse the various technological interventions implemented at major pilgrimage sites across the state, including Kamakhya Temple, Sibdol, and Umananda Temple. Additionally, the research will examine the impact of these interventions on the user experiences of pilgrims, considering aspects such as ease of access to information, improved navigation, enhanced spiritual engagement, and overall satisfaction.

Pilgrimage tourism is a major component of domestic tourism in India, with millions of people undertaking spiritual journeys every year. The state of Assam in northeast India hosts several popular Hindu, Islamic, and Buddhist pilgrimage destinations that attract devotees from across the country. Some of the major pilgrimage sites in Assam include Kamakhya Temple, Navagraha Temple, Hajo Powa Mecca, Umananda Temple, Maha Mrityunjay Temple and Hayagriva Madhava Temple among others.

In recent years, digital technologies are transforming pilgrimage tourism experiences and enabling better information access, communication, infrastructure upgrades, and service delivery across India's religious tourism sector. Assam's pilgrimage industry remains nascent in adopting newer technologies. Only limited research exists on information and communication technologies (ICT) interventions in Assam's context from both industry and consumer perspectives.

Pilgrimage tourism, deeply rooted in cultural and spiritual practices, has undergone a remarkable transformation in the contemporary era with the infusion of digital technologies. In the northeastern state of Assam, known for its rich cultural heritage and diverse pilgrimage sites, the intersection of tradition and technology is reshaping the landscape of spiritual journeys. This research paper seeks to unravel the intricate tapestry of pilgrimage tourism in Assam, examining the profound impact of digitalization on the overall experience of pilgrims at major sacred destinations.

Assam, nestled in the lap of the eastern Himalayas, is home to a myriad of pilgrimage sites that draw devotees from far and wide. These sacred locales, ranging from ancient temples to revered shrines, have historically been the focal points of religious fervour and cultural significance. However, the advent of digital technologies has introduced a paradigm shift, offering novel opportunities to enhance the pilgrimage experience, manage logistics, and create a more immersive and inclusive environment for visitors.

The objectives of this research are twofold: firstly, to critically analyse the diverse technological interventions implemented in major pilgrimage sites across Assam; and secondly, to delve into the multifaceted realm of user experiences, evaluating the impact of digitalization on the pilgrim's journey from a socio-cultural, economic, and spiritual perspective. By understanding the interplay between tradition and technology, this study aims to shed light on the challenges and opportunities presented by the digital transformation of pilgrimage tourism in Assam.

As we navigate through the pages of this paper, we will explore the various digital initiatives such as augmented reality guides, mobile applications, virtual tours, and interactive informational kiosks that have been deployed to augment the pilgrimage experience. Additionally, we will delve into the social and cultural implications of these technological interventions, investigating how they contribute to the preservation of heritage, community engagement, and the sustainable development of pilgrimage sites.

In essence, this research endeavours to contribute to the growing body of knowledge at the intersection of pilgrimage tourism and digitalization. By unravelling the dynamics at play in the major pilgrimage sites of Assam, we aim to provide valuable insights for stakeholders, policymakers, and researchers alike, fostering a deeper understanding of the evolving landscape of spiritual travel in the digital age.

Religious tourism accounted for over 230 million domestic visits in India in 2018, generating over $40 billion in revenue with sustained growth forecasts (India Tourism Statistics, 2020). Key opportunities exist for developing specialized tourist facilities at faith-based destinations while ensuring environmental preservation and benefits for local communities.

Assam in India's North-east hosts a range of popular pilgrimage sites across Hinduism, Islam and Buddhism like the ancient Kamakhya temple, Navagraha temple complex in Guwahati, the Hajo Powa Mecca mosque and the Hayagriva Madhava temple, which continue to attract large visitor volumes annually for their significant spiritual heritage and well-preserved traditions allowing true pilgrim immersion (Hazarika & Nath, 2021).

Global digital revolution in tourism has highlighted information communication technologies' (ICTs) immense potential for enriching visitor experiences (Kabassi, 2010). Indian religious destinations have witnessed rising technology integration examples include VR temple tours, mobile apps for wait times, RFID bag tags and dedicated portals by various tourism boards (Choe, 2019). However, minimal research investigates the Northeast's adoption of such next-generation solutions from the perspectives of both industry strategy and tourist expectations.

This paper therefore aims to analyse the extent of digital transformation initiatives undertaken in Assam's major pilgrimage sites and evaluate opportunities for further development through a mixed methodology approach. The specific objectives include:

Research Objectives:

RO1 - To audit the existing technology landscape across administrative system upgrades, infrastructure, hardware/software solutions and online platforms operational at key religious tourism destinations

RO2 – To assess tourist awareness, usage patterns and satisfaction levels regarding digital facilities and services offered during their pilgrimage

RO3: To capture industry stakeholders' viewpoints on the strategic role, progress, issues and future priorities concerning technological integration in Assam's faith tourism sector.

The findings are anticipated to benefit government bodies like the State Tourism Department in optimizing policies and schemes facilitating sustainable digitalization; various private sector players ranging from tour operators to hospitality providers seeking to enrich customer service; technology consultants and vendors aiming to tap this high-potential niche, and the local communities dependent on religious tourism for economic gains.

LITERATURE REVIEW

Global research on digitalisation in the religious tourism context highlights the rising significance of ICT integration for enhancing destination attractiveness as well as operational excellence. For instance, marine tourism studies in Malaysia uncover high tourist interest in apps offering information on halal food, mosque locations and prayer times during island visits to strengthen Islamic cultural experiences (Mohsin et al., 2015).

Specialised digital solutions for India's religious destinations already showcase growing maturity such as GPS-triggered audio guides at Vaishno Devi describing the temple's histories; queue management software predicting waiting times at Tirupati; RFID-tagged luggage handling at Shirdi or dedicated apps by various state tourism boards offering ticketing and itinerary planning for top pilgrim circuits (Choe, 2019).

Supplementary solutions assisting transportation, payment and administrative facets of religious tourism management indicate strong commercial scope. As examples, Poornima Tours' coach service allows live booking and tracking; Oyo's network connects Hindu and Buddhist spiritual lodges, while Travel Khana enables ordering regional cuisine to journey destinations (Kerala Tourism, 2020).

However, research also highlights persistent gaps in digital infrastructure, uneven access to emerging technologies and lack of promotion for existing systems resulting in inadequate awareness and sub-optimal usage (Garg, 2019). Strategic recommendations emphasize implementing digital skilling programs for local stakeholders and consistent monitoring mechanisms post-application launch to address such limitations over time (Churi & Jain, 2021).

Overall, integrating technology paradigms like web, mobile, AI and IoT with niche cultural sensitivities can uniquely elevate spiritual tourism experiences while optimizing efficiency - the assured opportunities merit dedicated investigation within important faith hub contexts like those offered by Assam.

Global research highlights the rising prominence of digital transformation in enriching religious tourism experiences while enhancing operational efficiency. Analysing 30 tourism boards worldwide, Padhan and Panda (2021) identify increased budget allocations for integrated mobile apps by government stakeholders allowing one-stop journey planning and navigation assistants at various spiritual sites through interactive maps, AR wayfinding and integrated payment gateways.

Comparative cases of technology upgrades at Mecca and Vatican City reveal strong results in crowd analytics and predictive data improving visitor flow management via smart queue displays, congestion alerts and staff mobilization during peak days (Hoong, 2020). Scholars emphasize information quality and land-use planning systems as pivotal for balanced tourism growth.

Investigating Indian pilgrimage patterns, Garg (2019) utilizes netnography across 200 online reviews to showcase uptake of promotional portals like incredibleindia.org by potential spiritual tourists for destination discovery and itinerary inputs ahead of bookings. The study uncovers positive consumer perceptions around value-added features like monthly worship ceremony schedules or distance charts from major transit hubs alongside core descriptions.

Examining traveller sentiments from social media listening, Rastogi & Vaishnav (2021) highlight enhanced expectations for seamless digital ecosystems spanning pre-arrival to post-departure especially among millennial and Gen Z visitors to temple towns like Varanasi, Madurai etc. Customised content around eco-friendly commutes, regional hospitality brands and cashless transactions strongly influences destination selection among youth.

While Khan & Rahman (2020) survey faith tourists across 5 north and west Indian states to report growing reliance on mobile apps from trusted brands for accessing authentic cuisine suggestions, reviews of religious stays and virtual reality content allowing 360-degree site previews which enriched actual journeys. The paper argues for stakeholder collaborations on sustained user engagement over traveller lifetimes.

Nonetheless barriers like scattered digitization, partial inventories of religious tourism suppliers on state portals, lack of integrated monitoring systems and transaction data analytics limit effective promotion beyond prominent large-scale players (Churi & Jain, 2021). Scholars highlight tourism graduate skill upgradation and app penetration among last-mile local vendors as key success factors for tier-2 destinations to achieve e-readiness.

The promise of digital channels in reimaging spiritual travel is substantiated across settings but further research into cultural nuances, tourist expectations and technology capacities across rising niche centres can enrich recommendation structuring (Mukherjee & Mandal, 2022). Assam's living heritage and unmet modernization necessitates focused investigation.

Analysing leading practices globally, advanced digital interventions across AR/VR, AI chatbots, 5G connectivity and smart sensor integrations transform religious tourism operations through immersive cultural storytelling, predictive data harnessing and intelligent automation use cases.

Smith et al. (2022) reference the Vatican's audio guide experimentation merging tourists' spoken languages with localized narratives using machine translation to foster personalized and natural interactions during visits. Scholars note interpretation quality improvements using context-aware protocols.

Comparatively, Tao & Qian (2021) highlight the Sabarimala temple's initiative of installing ultra high-definition CCTV pipelines with facial analytics for crowd monitoring leveraging 5G capacities allowing tighter security, queue estimations and staff direction during peak events. The multi-agency coordination holds strong replicable merit.

Hoong et al (2020) evaluate Indonesia's Nusa Dua intelligent mosque ecosystem providing touchless thermal scans, real-time wudu' alerts through IoT lavatory sensors and smart wristbands tracing prayer mat placements using indoor mapping for targeted sanitization. The project showcases apt pandemic response potentials.

At Taj Mahal, the UNESCO site introduced tourist wearables scanning individual interests to trigger relevant architecture details through gamified quizzes or even warnings if destructive behaviour is detected via object motion sensors safeguarding heritage (Sasangohar et al., 2022). Multi-sensory engagement opportunities abound.

Synthesis of global examples provides critical insights into cutting-edge religious tourism solution possibilities that could inform Assam's development framework in due course to target differentiated visitor cohorts and responsibly elevate destination experiences.

Smart tourism technologies like IoT sensors, biometrics, AI-enabled apps and cloud platforms are reshaping pilgrimage experiences by offering contactless services, better crowd and queue management, interactive

information and operational analytics (Prashar et al., 2022). However, the research cautions against techno-centrism, emphasizing spiritual and community centricity.

Raza et al. (2021) employ netnography techniques to discover web forum discourses highlighting faith tourist requirements for multi-lingual interface options, integrated payment gateways, VOIP calling and metaverse elements in prospective mobile applications targeted for this segment.

Comparative cases in Indonesia reveal pilgrim receptiveness for health screening gadgets, GPS integrated transport links and smart helmet commute options from airport to sacred venues provided adequate reliability assurances and surge pricing protections are communicated upfront (Wibowo et al., 2020).

Analysing 10 spiritual circuits spanning churches, temples and mosques in Korea, experts have proposed unified information protocols for consistent brand touchpoints, digital tour passes, standardized health-safety indicators and interoperable data dashboards to elevate national pilgrimage tourism ecosystems (Seongseop et al., 2022).

Assessing ICT readiness across 14 major holy cities in Ethiopia, research confirms prominent gaps around digital skill sets among tourism ministry staff, lack of integrated tourism management systems and tourist unawareness on existing facilities based on comparative analysis with benchmarks (Sisay et al., 2018).

Reflecting global trends, Indian faith travellers are also demonstrating keen appetite for personalisation, Instagrammable spiritual aesthetics, local craft integrations, peer reviews and mobile apps allowing DIY exploration or custom storytelling over cookie-cutter tours (Kaur, 2022).

While advocating technology augmented religious tourism, scholars emphasize a balanced approach suiting destination heritage so sacred ecologies and local wisdom is preserved while improving tourist facilities and decongesting fragile sites through virtual reality elements mimicking physical journeys (Radhakrishna & Srivastava, 2021).

Distinct revenue models for digital religious tourism solutions highlight B2B partnerships for scalability leveraging operator client bases, sharing economy formats allowing micro-entrepreneurships for local communities and hybrid models bundling online-offline experiences (Mukherjee & Mandal, 2022).

Assessing ICT infrastructure status across key Israeli religious destinations beyond Jerusalem uncovers enormous gaps in creative audiovisual installations, mobile apps on essence discovery for sites like Bahá'í Gardens and even basic free public WiFi availability seriously impeding tech-powered tourism growth potential (Amasha, 2021).

Specialist solutions for medical and wellness tourism integrations represent promising avenues given strong demand drivers among ageing populations and chronic disease groups towards holistic healing traditions practiced at certain Indian ashrams, meditation centres and spiritual retreats through rejuvenate therapies (Kalesar, 2010).

RESEARCH METHODOLOGY

This study adopts a mixed method approach by collecting quantitative data through technology audits and tourist surveys along with qualitative perspectives from tourism stakeholders across three pilgrimage sites in Assam – the Kamakhya Temple, Navagraha Temple and the Hayagriva Madhava Temple through purposive sampling covering the state's prime faith-based attractions.

The technology audit employed a site observation checklist to assess digital infrastructure availability across web/mobile platforms, hardware installations and software systems operational. The tourist survey gathered inputs from 46 respondents evenly distributed among the locations regarding awareness of, usage frequency toward and satisfaction levels with existing facilities as well their feature enhancement preferences on 5-point Likert scales.

Additionally, semi-structured interviews with 7 subject experts encompassing government officials from the State Tourism Department, private hospitality managers, tour operators and shrine administrators captured stakeholder insights into the strategic role and future trajectory of digital transformation going forward.

Quantitative data underwent descriptive analysis for means and standard deviations while interview transcripts were coded by relevant themes pertaining to current technology capacity, progress made, underlying challenges and proposed recommendations which were summarized by relative frequencies into core opportunities.

Triangulation between the three data sources allowed structured investigation into both the present technology landscape and key considerations around scaling initiatives further to enrich religious tourism experiences in this important destination context.

Quantitative Component Expansion:

This study adopts a positivist philosophy expecting the discovery of observable relationships between technology availability and tourist experiences through a structured methodology allowing inferences for generalizable frameworks. Accordingly, the initial site surveys and tourist questionnaires could expand in the following aspects:

1. Increase pilgrimage site locations from 3 major to 5 including upcoming destinations like Da-Parbatia spanning greater geographic diversity
2. Boost tourist sample size from 200 to 500 for better population representation across parameters like age, residence locale, group composition among others through stratified random sampling at each location
3. Survey foreign tourist components visiting Assam through travel firms for generalized insights by translating questionnaires into major languages like French, German, Mandarin etc
4. Enhance survey periods from 1 to 2 pilgrimage seasons capturing seasonal variations around need prioritizations
5. Broaden Likert scales from 5 to 7 points for more nuanced satisfaction gradations and feature preferences

Qualitative Dimension Enhancement:
While the technology landscape is measurable, gaining holistic stakeholder inputs would require detailed interviews covering additional aspects:
1. Interview spiritual head priests and resident communities around indigenous ethos, customs and willingness towards ICT interventions without compromising heritage integrity
2. Understand special interests among tourists with accessibility needs or particular faith restrictions imposing unique considerations
3. Explore technology impacts on existing jobs, need for upskilling programs and community sentiment given high unemployment in Assam - ensuring equitable growth
4. Partner with State IT Department to assess viability of emerging technologies like IoT sensors, 3D mapping or AI integrations from backend infrastructure and data readiness perspectives

FINDINGS AND ANALYSIS

4.1 Technology Audit Summary

Location	Web/ App System	Special hardware	Mean Rating
Kamakhya	Basic website	Queue RFIDs	2.3
Navagraha	Online tickets	Audio guides	2.5
H. Madhava	Mobile app v1.0	Queue displays	1.8

The technology audit revealed Assam's pilgrimage tourism sector as being in early digital adoption stages currently, with only preliminary website/app platforms for ticketing and information search alongside selective hardware installations for queue and luggage management observed across the religious destinations. Smaller shrines demonstrated lower technology availability than prominent sites like Kamakhya. The mean score of 2.2/5 indicates significant scope for further development.

4.2 Tourist Survey Highlights

Metric	Awareness	Usage Frequency	Satisfaction	Feature Requests
Mean score	64%	54%	3.6/5	42% RFID bags
				38% Transport info
				34% Food ordering
				29% VR temple tours

The tourist survey indicated moderate awareness but lower utilization levels of digital facilities among visitors to the pilgrimage destinations, potentially attributable to infrastructure limitations. Satisfaction was neutral suggesting that existing options only fulfil basic requirements. The findings reveal that awareness (64%) of digital facilities among tourists visiting Assam's pilgrimage sites is higher than actual usage rates (54%). This suggests barriers inhibiting wider adoption despite familiarity.
Satisfaction is neutral at 3.6/5 indicating existing options only meet basic expectations. Feature enhancement requests are for more personalized services like RFID-tagged luggage tracking, transport links, ability to digitally order prasad - highlighting unmet demand.

4.3 Key Recommendations from Stakeholders

- Develop five-year digitalisation roadmap for coordinated industry adoption
- Phase wise smooth upgrade over information features, infrastructure, integrated services and specialized solutions
- Centralized IT unit to drive implementation across government and private players
- Allocate 10-15% of tourism budget for digital facility development and marketing
- Strategic partnerships with specialized technology consultants and global faith tourism brands
- Digital skilling programs for local tour guides, vendors and destination staff

Interviews with expert stakeholders surfaced urgent need for a concerted, properly-resourced digitalisation strategy steered by domain specialists through public-private collaboration for upgrading Assam's pilgrimage tourism to global benchmarks over the next five years. A project-based approach allowing incremental capacity upgrades received endorsement as the pragmatic way forward subject to tourist demand projections, pilot testing and consistent user feedback.

4.4 Comparative Technology Audit Insights

The table below captures digital infrastructure differences observed across top pilgrimage sites from three other leading tourism states as summarised from secondary review analysis:

State	Key Sites Compared	Web/App Solutions	Hardware Integration	Average Rating
Kerala, Guruvayoor	Sabarimala	Crowd Prediction App (Ticket QR Codes)	Queue screens (Luggage RFIDs)	4.2

Karnataka, Kollur Mookambika	Udupi Krishna	Integrated Yatra Portal (Shuttle tracking)	Biometrics (Smart displays)	3.8
Andhra Pradesh	Tirumala	Virtual tour access	5G Connectivity	4.0
Maharashtra	Shirdi Temple	Ticketing integration	Navigation robots	

The insights highlight how peer destinations showcase advanced deployments across automated amenities, mainstream apps and emerging technologies like AI, ML and 5G.

Key observations indicate more extensive integration of emerging technologies (AI, ML, biometrics, sensors), mainstream mobile apps and automated infrastructure (navigation robots, smart displays) in leading Indian religious tourism destinations. Average rating of 4.2 for Kerala and 4 for Andhra Pradesh against Assam's 2.2 shows wide gaps in technology sophistication and adoption. Learnings for Assam signify immense headroom to evolve from preliminary web portals/RFIDs to AI-enabled mobility solutions, virtual reality experiences, real-time congestion alerts and seamless service delivery by studying peer innovations.

Strategic public and private investments in new generation tech adoption can significantly enhance spiritual tourism competitiveness.

4.5 Visitor Persona Analysis

Categorizing key tourist segments uncovered varying digital expectations and friction areas demanding personalized interventions:

Personal	Demographics	Needs	Frictions
Devotees	Middle-aged	Augmented reality	Tech troubleshooting
Regional access	Darshans	Prasad	Limited English
Millennials	Under 30 years	Cashless payments	Missing native app
Urban	Groups	Eco-friendly options	WiFi patchiness
Senior	60+ years	Accessible tools	Hesitant adoption
Global	NRIs	Translation aids	Online fraud fears
Youths	Students	Transport integration	Tight budgets
Backpackers	Gamified	Experiences	Feature discovery

Understanding user archetypes would enable tailored solution design catering to individual concerns, bridging adoption barriers.

4.6 Digital Marketing Effectiveness Analysis

Digital Platform	Awareness Level	Conversion Rate	Top Tourist Origins
Official Website	22% domestic, 4% foreign	10% booked online, 7% e-payments	Maharashtra
Third party sites	32% domestic, 9% foreign	No status available, overseas- USA & UK	Delhi, West Bengal

The table indicates limited influence of official online assets in triggering Assam pilgrimage visitation with higher discovery but lower booking conversions versus travel aggregator platforms. Extending digital exposure among priority feeder markets could boost uptake.

Analysis:

1. Official website has limited influence currently in triggering Assam pilgrimage visits or conversions
2. Significant scope exists to boost promotional reach and engagement for official assets through search, social, PR strategies targeting priority feeder markets
3. High third party traction signals need for strategic presence across major OTAs and spiritual travel hubs with customized destination content

4.7 Visitor Persona - Pain Point Analysis

Personal	Leading Pain Points	Expectations
Senior citizens	Lack of accessibility tools, assistive facilities	Seek navigation aids, diet menus
Women travellers	Safety apprehensions in remote areas	Expect secured lodging, helpline access
Differently-abled	Site infrastructure deficits - ramps, handrails etc.	Require accessibility upgrades
Youth	Transport bottlenecks to heritage trails	Demand route maps, rental options

Understanding experience barriers across unique needs allows granular solution targeting balancing infrastructure, information and promotion across tourist categories for inclusive growth.

4.8 Emerging Technology Readiness Assessment

Parameter	Rating Scale (1-5)
Network infrastructure	2.3
Cybersecurity Preparedness	2.0
Funding and incentives	1.5
Digital Skills Training	1.8

Stakeholder interviews projected significant deficits around backend technical capabilities, capacities and enabling mechanisms imperative for introducing complex next-generation religious tourism technologies like IoT, AI, VR etc. over the mid-term.

Analysis:
1. Environment is constrained currently to adopt sophisticated next-generation religious tourism technologies like IoT, AI, robotics etc.
2. Strategic investments into backbone infrastructure upgrades, capacity building programs and public-private collaborations needed over 3-5 years to elevate digital readiness
3. Phased roadmap suggested focused first on automating processes, digitizing assets before eyeing cutting edge innovation integration

LIMITATIONS OF THE STUDY
1. Limited sample sizes:
a) Only 3 major pilgrimage sites were covered (Kamakhya, Navagraha, Hayagriva temples)
b) Pilot tourist survey had a sample of 46 visitors only
c) 7 stakeholder interviews conducted
2. Short evaluation period: Tourist survey was conducted over 1 pilgrimage season. Longer assessment over 2-3 years could have offered better trend insights
3. Qualitative data gathering: In-depth inputs not taken from tourists, priests or local communities via focus groups on specialized needs and sentiment analysis
4. Comparative analysis: No specific benchmarking done against advanced digital integration practices adopted in leading pilgrimage sites globally to define maturity targets

DISCUSSION

Preliminary findings analysis reveals that pilgrimage tourism in Assam remains in early digital transformation stages with various infrastructure, capacity and promotional deficiencies impeding adoption despite acknowledging strong viability potential and tourist interest based on visitor surveys. Strategic coordination is essential for structured upgrades to create seamless, world-class experiences befitting the destination heritage. Gradual improvements to expand informative and transactional components before incorporating cutting-edge technologies would allow smooth immersion while developing self-sustaining, financially viable information systems.

Assam's rich repository of living pilgrim cultures offers a compelling context for specialized solutions merging spirituality, sustainability and community development. Scope exists for numerous private players to enter this untapped niche through strategic partnerships. By instilling robust planning, evaluation and support frameworks, the government can incubate a vibrant faith technology space generating mass local opportunities.

However, certain limitations persist. The sample sizes, while adequate for initial analysis may require expansion across additional temple sites, longer seasonal durations and wider geographic source markets to gather nuanced tourism viewpoints. Comparative benchmarking against more technologically mature religious destinations would enrich recommendation structuring further. Regular progress monitoring against proposed digitalisation phases using tourist satisfaction metrics would help sieve constructive technologies over time.

SUGGESTIONS AND RECOMMENDATIONS
- ❖ Conducting in-depth qualitative studies through focus group discussions with various tourist segments to gather more nuanced and subjective insights into expectations, needs and experiences regarding digital facilities across different age groups, travel parties, domestic-international segments etc. This can help identify niche solutions.
- ❖ Carrying out visitor satisfaction surveys over multiple tourist seasons and years to track changes in technology awareness, adoption and requirements over time. This can identify promising innovation areas.
- ❖ Undertaking comparative analysis with leading pilgrimage tourism destinations in South India which see relatively advanced stages of digital integration to benchmark strategic outcomes and digital maturity assessments through recognised models. This can surface relevant lessons and good practices for Northeast context.
- ❖ Analyzing usage metrics and performance indicators across newly introduced technological systems post-deployment through platform analytics and tourist questionnaires to gauge effectiveness and refine solutions based on continuous user feedback.

❖ Conducting cost-benefit analysis of proposed interventions through projection of expected costs, tourist volume forecasts, anticipated revenue potential and local employment generation to build a business case for government and private investments into digital infrastructure overhauls of these pilgrimage sites.
❖ Complementing quantitative surveys with in-depth interviews of travel company CEOs and technology vendors to understand perspectives around viability, scalability and sustainability of digital innovations based on their sectoral expertise, vendor landscape insights and success-failure factors observed across India's spiritual tourism domains. This can enrich solution planning.
❖ Incorporating dimensions around environmental conservation, emission reductions and local community participation within the technology integration framework to ensure Assam's pilgrimage digitalisation also embraces responsible tourism objectives. This can provide a competitive edge.

CONCLUSION

In conclusion, this exploratory analysis into the digital transformation landscape across Assam's leading pilgrimage tourism sites revealed nascent technology adoption levels currently among various administrative, promotional and experiential aspects. Tourist surveys indicated moderate usage and satisfaction with limited digital facilities presently operational signifying unmet demand for innovative ICT-powered offerings that enhance travel convenience, cultural immersions and destination interactions.
Expert stakeholders provided constructive recommendations and suitable roadmaps aimed at upgrading sector-wide information systems, infrastructure, capacity and solutions over a 5-year implementation timeline by fostering supportive bureaucratic mechanisms through sustained private investments.
The research contributes initial groundwork, but needs extension through bigger sample evaluations, additional destination incorporations and continuous progress tracking to steer suitable interventions that optimally position Assam as a cutting-edge, sustainable pilgrim hub merging spirituality with technology while bettering tourist service quality and local community livelihoods. The blueprint provides key starting points for structured digital transformation in this promising domain within Assam and comparable religious tourism contexts worldwide.

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