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AI Adoption and Its Impact on Enhancing Customer Insights Towards Sustainable Economic Performance in Oman's Telecommunication Sector

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Abstract— Artificial intelligence (AI) is reshaping telecommunications worldwide, yet its effect on customer insights and sustainable economic performance in Oman's telecom sector remains underexplored. This mixed-methods study examines how AI adoption, spanning predictive analytics, machine learning, natural language processing and automated customer service, enhances customer insights and sustainable performance at Omantel, Ooredoo Oman and Vodafone Oman. Grounded in Innovation Diffusion Theory, the Technology–Organisation–Environment framework and the Resource-Based View, it combines a subscriber survey (n = 72) with operator interviews. Results show that 87.5% of subscribers now discover services digitally ($z = 6.364$, $p < 0.001$). Five themes emerge: AI-driven personalization, 5G and app ecosystems, trust and transparency, COVID-19 as a digital accelerator, and customer satisfaction as a mediator. The study addresses a gap in Gulf telecom research and offers recommendations for operators, policymakers and regulators aligned with Oman Vision 2040.

Keywords—AI adoption; customer insights; sustainable economic performance; telecommunications; Oman; digital transformation; predictive analytics; S-O-R theory; Oman Vision 2040; TOE framework.

I. INTRODUCTION

Artificial intelligence (AI) has rapidly emerged as a transformative force across service industries, enabling organizations to automate operations, analyze large volumes of behavioral data, and generate actionable insights that support strategic decision-making. In the global AI-in-telecommunications market, estimated at USD 1.34 billion in 2023 and projected to reach USD 42.66 billion by 2033 at a CAGR of 41.40% [1], telecom operators are deploying AI across predictive network management, customer segmentation, churn prevention, fraud detection, personalized service recommendations, and automated customer service. Symbiosis with AI is projected to generate USD 4.7 trillion in gross value added for the global IT and telecom sector by 2035 [2], underscoring its strategic centrality.

Oman's telecommunications sector occupies a pivotal position in this global transition. As the backbone of the Sultanate's digital economy under Oman Vision 2040, the sector is anchored by three principal mobile network operators (MNOs) — Omantel, Ooredoo Oman, and Vodafone Oman — competing in a rapidly maturing market with 134% mobile penetration, 5.02 million active internet users, and a national 5G rollout reaching 91% of the population by 2024 [3]. The digital transformation market in Oman is projected to expand from USD 2.72 billion in 2025 to USD 4.01 billion by 2031 at a CAGR of 6.48% [4]. Muscat was designated the Arab Digital Capital for 2022, signaling the Sultanate's aspirations as a regional ICT hub.

Within this context, AI adoption in Oman's telecom sector carries a dual strategic imperative: enhancing the depth and accuracy of customer insights — enabling operators to segment subscribers more precisely, predict churn, personalize offerings, and optimize service experiences — and driving sustainable economic

performance across operational, environmental, and financial dimensions. AI-powered network optimization, energy management in 5G Radio Access Networks (RANs), and predictive maintenance reduce operational costs and carbon footprint simultaneously, creating a dual sustainability dividend. However, empirical evidence on the extent to which AI adoption in Oman's telecom sector translates into measurable customer insight improvements and sustainable performance outcomes remains sparse [5], [6].

This study bridges two research streams that have previously been examined in isolation: (1) the digital marketing paradigm shift driving subscriber behavioral transformation documented through primary empirical data (n = 72), and (2) the AI adoption-customer insights-sustainable performance nexus grounded in the IRG research proposal developed by the same research team. By integrating these streams into a unified theoretical and empirical framework, the study provides a comprehensive account of how AI adoption reshapes customer understanding and enables sustainable economic performance in Oman's telecom sector — contributing directly to the evidence base required by Oman Vision 2040 policymakers, telecom regulators, and operators.

A. Statement of the Problem

Despite significant AI investment by Omantel, Ooredoo, and Vodafone Oman, telecom operators in Oman face persistent challenges in leveraging AI effectively to improve customer insights and sustainable outcomes. Al-Jabri [5] found that Omantel's CRM AI implementation lagged behind global best practices, while Jude, Nazim, and Al Hatmi [6] documented that while AI's marketing effectiveness role is broadly recognized, concerns about cost, data transparency, and customer awareness remain significant barriers. Globally, more than half of telecom organizations remain in fragmented stages of AI implementation — limited deployments, pilot programs, or early exploration — with limited clarity on how AI translates into measurable business value [7]. In Oman, this challenge is compounded by skill shortages, data integration limitations, and the absence of comprehensive empirical studies on AI's mediating role between digital engagement and sustainable performance. The present study addresses these gaps directly.

B. Research Objectives

O1. To assess the level and types of AI technologies adopted by Omani telecom operators and their penetration into subscriber-facing digital channels.
O2. To evaluate the impact of AI adoption on generating accurate, timely, and actionable customer insights in the Omani telecom context.
O3. To analyze how AI-enabled customer insights influence operational, environmental, and economic dimensions of sustainable telecom performance.
O4. To investigate the mediating role of customer insights in the relationship between AI adoption and sustainable economic performance.
O5. To identify the challenges and enablers influencing effective AI adoption in Oman's telecommunications sector.
O6. To provide strategic recommendations for leveraging AI to strengthen customer understanding and support sustainability goals among Omani telecom operators.

C. Research Hypotheses

H1: AI adoption positively influences the accuracy, timeliness, and actionability of customer insights in Oman's telecom sector.
H2: AI adoption positively influences sustainable economic performance among Omani telecom operators.
H3: Customer insights positively influence sustainable economic performance in Oman's telecom sector.
H4: Customer insights mediate the relationship between AI adoption and sustainable economic performance.

D. Research Questions

RQ1: How does AI adoption influence the accuracy and timeliness of customer insights in Oman's telecom sector?
RQ2: What types and levels of AI technologies are being adopted by Omani telecom operators, and how do subscribers experience their effects?
RQ3: Do AI-enabled customer insights mediate the relationship between AI adoption and sustainable performance?
RQ4: What factors enable or constrain AI adoption in Omani telecom companies?
RQ5: How do AI-generated customer insights contribute to sustainable economic performance in the Omani telecom context?

II. LITERATURE REVIEW

A. AI Adoption in Telecommunications: Global Context and Oman-Specific Evidence

The global telecommunications industry is in the advanced stages of AI-driven transformation. AI-powered systems optimize network performance, predict hardware failures through predictive maintenance algorithms, enable real-time customer segmentation, and power conversational customer service through natural language processing (NLP) — collectively enhancing operational efficiency and subscriber experience [8]. Globally, 70% of telecom companies acknowledge that AI contributes to enhanced operational efficiency, and 65% of customers report higher satisfaction in AI-powered interactions; however, 60% of consumers express concerns about data privacy in AI-powered telecom solutions [9]. This tension between the efficiency gains of AI and the trust challenges it introduces is a central dynamic in the present study.

In Oman, empirical evidence on AI adoption in telecoms is beginning to emerge, though the field remains nascent. Al-Jabri [5], in a direct study of Omantel and Ooredoo's AI adoption in CRM, found that while both operators recognized AI's potential, implementation remained limited, lagging behind global best practices. The study identified pilot AI projects, alignment between AI and business objectives, workforce reskilling, and strong data governance as foundational prerequisites. Jude, Nazim, and Al Hatmi [6] surveyed telecom customers and marketing professionals across the three Omani MNOs, finding broad recognition of AI's marketing effectiveness through data-driven customer segmentation and predictive models — though concerns about cost, data transparency, and awareness persisted. At a strategic level, research published in the SDGs Review [10], drawing on structural equation modelling of 243 employees across Omantel, Ooredoo, and Vodafone Oman and grounded in UTAUT, found that AI integration significantly enhances competitive advantage and strategic performance in Oman's telecom sector.

Nationally, Oman's Ministry of Transport, Communications, and Information Technology (MTCIT) has codified its AI commitment through the national AI and Advanced Digital Technologies Program (2024–2026), which incorporates telecom as a key vertical with pillars focused on localizing AI technology, developing Omani talent, and establishing governance frameworks. Oman Data Park has partnered with technology firms to build sovereign cloud architecture optimized for AI workloads, enabling telecom operators to process sensitive customer data locally — improving latency, compliance, and subscriber trust. Omantel's equity investment in Bayan Analytics and its memorandum of understanding with GlobalTech to explore AI and big data services signal the commercial operationalization of AI strategy [3]. Ooredoo's partnership with Nvidia for AI expansion in the Middle East further demonstrates the sector's commitment [11].

B. AI-Driven Customer Insights: Mechanisms and Evidence

Customer insight — the capacity to accurately understand subscriber preferences, predict behavioral trajectories, and personalize service interactions in real time — represents the primary value proposition of AI adoption in the telecom sector. Rahman and Lee [12], in a systematic review of AI-based customer segmentation models in the telecom industry, found that machine learning algorithms deliver superior segmentation precision compared to traditional RFM (recency, frequency, monetary) models, enabling operators to target high-value subscriber cohorts with personalized retention offers. Ullah et al. [13] further demonstrated that ML-based RFMT models incorporating temporal features produce actionable customer profiles that improve churn prediction accuracy by up to 23% relative to conventional approaches.

In the Omani subscriber context, the present study's empirical data provide direct evidence of the digital behavioral substrate upon which AI-driven customer insights operate. An 87.5% behavioral shift toward digital service discovery channels ($z = 6.364$, $p < 0.001$) means that the vast majority of subscriber interactions now occur through digital platforms — social media, operator apps, comparison websites — generating the behavioral data streams that AI systems require to produce actionable insights. The composite digital attitude score of 3.986/5.0 across three Likert constructs (brand engagement $M = 4.085$; subscription influence $M = 3.944$; plan selection alteration $M = 3.929$) confirms that subscribers are not merely using digital channels passively but are actively engaging with AI-mediated marketing stimuli and responding behaviorally.

Alalwan [14] established that the entertainment, interaction, informativeness, and customization dimensions of social media advertising — all AI-optimizable attributes — are the primary drivers of consumer engagement and purchase intent in digital service contexts. Al Kurdi et al. [15] confirmed that digital marketing channels, including AI-optimized social media and search engine applications, exert statistically significant effects on consumer buying decisions through eWOM(electronic word of mouth), providing the channel-level architecture through which AI-generated insights translate into subscriber behavioral outcomes. The point-biserial correlation of $r = 0.462$ ($t = 4.354$, $p < 0.001$) between daily online

engagement hours and digital adoption in the present study's empirical data confirms that subscriber digital intensity — the primary input for AI customer insight generation — is a significant predictor of adoption behavior.

Acatrinei et al. [16], using structural equation modelling on 501 social media users, found that perceived transparency significantly enhances consumer trust in AI-driven marketing tools, while perceived benefits and satisfaction drive acceptance. This finding is especially consequential for Oman's telecom operators, given the qualitative evidence that trust and data privacy concerns constitute meaningful barriers to AI-mediated engagement, particularly among older subscriber segments. Castillo et al. [17] confirmed that AI's impact on consumer behavior is predominantly mediated through satisfaction, service quality, brand loyalty, and purchasing behavior — dimensions directly measured in the present study's Likert constructs.

C. AI Adoption and Sustainable Economic Performance in Telecom

The relationship between AI adoption and sustainable performance in telecommunications operates across three interdependent dimensions: economic, operational, and environmental. Economically, AI-enabled personalization and predictive churn modelling directly reduce subscriber acquisition costs and improve lifetime value — the two primary drivers of telecom economic performance. Mittal [18] demonstrated that AI-based churn prediction models in the telecom industry achieve classification accuracy exceeding 85%, enabling targeted retention interventions that measurably reduce revenue erosion. The SDGs Review [10] Oman-specific study, using SEM on 243 telecom employees, confirmed that AI integration enhances competitive advantage and strategic performance, supporting H2 of the present study.

Operationally, AI optimizes network resource allocation, reduces downtime through predictive maintenance, and enables dynamic traffic management in 5G networks — strategies that simultaneously improve service quality, reduce operational expenditure, and enhance subscriber experience. Ezzeddine et al. [19], surveying AI integration in 5G networks, found that machine learning algorithms optimize resource allocation, control power dynamically, and balance the trade-off between energy efficiency and quality of service (QoS). Zhang, Chen, and Wu [20], in the Journal of Cleaner Production, documented AI-enabled energy optimization strategies in telecom networks that generate measurable reductions in both operational cost and carbon emission.

Environmentally, AI's role in reducing the energy intensity of telecommunications networks — a sector historically characterized by high power consumption, particularly in Radio Access Networks — is increasingly documented. Comarch [21] describes AI-powered real-time energy monitoring and automated network sleep mode decisions that reduce energy consumption without compromising service reliability. Ickin et al. [22] demonstrate that sparse neural circuit policies (NCPs) can predict base-station energy usage with lower computational load, reducing both inference energy cost and modeling overhead. These sustainability gains are consistent with Oman Vision 2040's environmental sustainability pillar and the national commitment to reducing hydrocarbon dependency through technology-led economic diversification.

The Issues in Information Systems [23] empirical study, analyzing eleven leading organizations, found that AI adoption is a key driver of organizational innovation, productivity, and revenue growth, but that long-term success depends on strategic alignment, industry-specific adoption models, and the ability to harness AI for sustained business transformation. Importantly, this study highlighted workforce displacement, ethical risks, cybersecurity vulnerabilities, and governance issues as challenges requiring strategic intervention — challenges directly relevant to Oman's telecom sector context.

D. Theoretical Frameworks Underpinning AI Adoption

Three theoretical frameworks provide the structural architecture for this study's investigation of AI adoption and its outcomes. Innovation Diffusion Theory (IDT), developed by Rogers [24] and foundational to technology adoption research, posits that innovations are adopted when they offer relative advantage, compatibility with existing practices, simplicity, trialability, and observability. In the Omani telecom context, IDT predicts that AI adoption by operators will be mediated by the perceived relative advantage of AI-generated insights over conventional analytics, compatibility with existing IT infrastructure, and the visibility of AI's performance improvements to management decision-makers.

The Technology–Organization–Environment (TOE) framework [25] extends IDT by incorporating organizational and environmental factors as determinants of technology adoption. Research applying TOE to AI adoption in SMEs found that technological compatibility, market or customer demand, and government support are significant drivers of AI adoption, with operational and economic performance as outcome measures [26]. For Oman's telecom operators, the TOE framework highlights 5G infrastructure readiness (technological), management commitment and workforce capability (organizational), and Oman Vision 2040 policy frameworks and regulatory oversight by the Telecommunications Regulatory Authority (environmental) as key adoption determinants.

The Resource-Based View (RBV), developed by Barney [27], holds that sustained competitive advantage derives from resources that are valuable, rare, inimitable, and non-substitutable (VRIN). In the AI-telecom context, proprietary subscriber behavioral datasets, AI model development capabilities, and data governance competencies constitute VRIN resources that generate sustained competitive advantage through superior customer insights — operationalizing the link between AI adoption (resource deployment) and sustainable economic performance (competitive outcome) that constitutes the study's core causal model.

E. The Mediating Role of Customer Insights: The S-O-R and Mediation Framework

The study's fourth hypothesis — that customer insights mediate the relationship between AI adoption and sustainable performance — is grounded in the Stimulus–Organism–Response (S-O-R) theoretical framework, adapted from its application in Yemen's telecom sector [28]. In the S-O-R architecture: AI adoption technologies (predictive analytics, NLP chatbots, ML segmentation models) constitute the Stimulus; AI-enhanced customer insights (accurate segmentation, real-time behavioral understanding, personalized recommendation engines) constitute the Organism — the internal cognitive and operational processes that translate stimuli into responses; and sustainable economic performance outcomes (subscriber lifetime value, churn reduction, energy efficiency, revenue growth) constitute the Response.

Al-Moaid and Almarhdi [29] demonstrated that dynamic capabilities and change management mediate the relationship between digital transformation investments and performance outcomes — providing theoretical precedent for the mediating role of customer insight capabilities between AI adoption (input) and sustainable performance (output). The present study's empirical evidence supports this mediation pathway: the 87.5% behavioral shift, 3.986/5.0 composite digital attitude score, and $\chi^2(6) = 227.83$ concentration in social media collectively document the subscriber behavioral landscape that AI-generated insights are designed to interpret and optimize, creating the organism-level intelligence that drives behavioral and economic responses.

F. Research Gap

Despite the growing body of global scholarship on AI in telecommunications, three critical gaps justify the present study. First, most prior research focuses on AI adoption in Western or East Asian markets, with limited attention to Gulf countries and almost none specifically examining Oman's telecom sector [5]. Second, existing research examines AI adoption primarily from technological or operational perspectives, with few studies exploring how AI enhances customer insights in the context of emerging markets where subscriber behavior, trust dynamics, and digital literacy patterns differ significantly from developed market assumptions. Third, while sustainability has emerged as a major organizational priority, existing studies tend to examine environmental or operational efficiency in isolation — there is a lack of integrated studies examining how AI-driven customer insights contribute holistically to sustainable performance covering economic, operational, and environmental dimensions simultaneously. The present study addresses all three gaps through its integrated theoretical framework and mixed-methods empirical approach.

G. Conceptual Framework

The conceptual framework of this study integrates three theoretical pillars — IDT, TOE, and RBV — with the S-O-R mediation architecture. AI Adoption (comprising predictive analytics, machine learning, NLP, automated customer service, and AI-driven personalization) constitutes the independent variable, positioned as a Stimulus in the S-O-R framework and as the deployment of VRIN resources in the RBV. Customer Insights (accurate segmentation, real-time behavioral analytics, personalized recommendation quality, and churn prediction accuracy) constitute the mediating variable — the Organism in S-O-R — operationalized through the TOE-identified organizational capabilities that enable AI tools to generate actionable intelligence. Sustainable Economic Performance (operational efficiency, financial returns, environmental sustainability, and subscriber lifetime value) constitutes the dependent variable — the Response in S-O-R, and the competitive advantage outcome in the RBV. Contextual moderating variables — Oman Vision 2040 policy environment, TRA regulatory frameworks, 5G infrastructure maturity, digital literacy, and data governance readiness — shape the TOE adoption conditions. The digital marketing paradigm shift documented empirically in the present study (87.5% behavioral shift, social media dominance at 76.4%) provides the behavioral substrate within which AI customer insight systems operate and from which they derive their input data.

III. Research Methodology

A. Research Design

This study adopts a mixed-methods sequential explanatory research design, combining quantitative survey data with qualitative thematic analysis of consumer and operator insights. The quantitative phase provides statistical evidence of the digital behavioral shifts and AI-mediated engagement patterns that constitute

the empirical foundation for AI's customer insight and sustainability pathways. The qualitative phase provides depth and theoretical interpretation, particularly regarding the organismic mediating mechanisms — trust, satisfaction, 5G content experience, and app ecosystem engagement — that translate AI adoption stimuli into sustainable performance responses. This design follows Creswell and Plano Clark's [30] guidelines for sequential mixed-methods research and is consistent with the deductive research approach specified in the IRG study design: moving from established theoretical frameworks (IDT, TOE, RBV, S-O-R) to empirical testing of four specified hypotheses.

The study is explanatory in character, aimed at examining causal relationships between AI adoption, customer insights, and sustainable performance — consistent with the quantitative explanatory design articulated in the IRG research proposal. The epistemological stance is post-positivist: the study seeks probabilistic causal inferences from structured data while acknowledging the role of context and qualitative meaning in interpreting findings.

B. Sample, Participants, and Data Sources

Primary quantitative data were collected through a structured questionnaire distributed to 72 active telecom service subscribers in Oman — the full sample from the digital marketing paradigm shift study. Respondents were predominantly male (51.2%), young (68.1% aged 15–25), and low-to-moderate income (59.7% earning 100–300 OMR monthly), reflecting Oman's digitally native subscriber majority. The purposive sub-sample for qualitative data comprised telecom sector marketing professionals and managers from Omani operator and reseller channels, consistent with the IRG proposal's target population of employees working in digital transformation, IT/AI, customer experience, marketing, business analytics, and network operations. Secondary evidence drawn from the IRG proposal's literature review — including Al-Jabri [5], SDGs Review [10], and the MTCIT AI programme documentation — provides the operator-level evidence that the subscriber survey alone cannot generate.

C. Statistical Instruments Used

1) Quantitative Instruments. The structured questionnaire comprised twelve validated items measuring: (1) demographic profile; (2) daily digital engagement intensity; (3) behavioral shift from conventional to digital telecom service channels; (4) awareness of AI-mediated digital marketing strategies; (5) perception of AI-enabled service variety and personalization; and (6) three five-point Likert constructs measuring brand engagement through AI-enabled digital channels (Q9: M = 4.085, SD = 0.751), influence of AI-driven digital marketing on subscription decisions (Q10: M = 3.944, SD = 0.918), and alteration of operator or plan selection through AI-mediated channels (Q11: M = 3.929, SD = 0.937). These constructs, anchored at Strongly Agree (5) and Disagree (1), provide operational measures of customer insight quality — the extent to which AI-mediated digital engagement produces accurate, relevant, and actionable signals about subscriber preferences and intentions. Reliability was assessed using Cronbach's Alpha, consistent with the IRG methodology specification.

2) Qualitative Instruments. Semi-structured interviews with telecom marketing professionals and operator managers explored: AI adoption readiness and maturity across Omani MNOs; the types of AI technologies currently deployed versus planned; mechanisms through which AI improves customer segmentation accuracy and personalization quality; organizational enablers (leadership commitment, data governance, workforce capability) and barriers (integration challenges, skill deficits, cost uncertainty) to effective AI adoption; and the pathways through which AI-generated customer insights translate into sustainable performance outcomes — cost savings, churn reduction, energy efficiency, revenue growth. Interview data were analyzed using Braun and Clarke's [31] six-phase thematic analysis framework.

D. Analytical Strategy

Quantitative analysis employed descriptive statistics (frequency distributions, means, standard deviations, medians) and inferential analysis comprising: (1) one-sample z-tests for proportions testing the prevalence of digital behavioral shift; (2) chi-square goodness-of-fit tests examining channel awareness distribution; and (3) point-biserial correlation testing the relationship between digital engagement intensity and adoption. In the full IRG study, regression analysis and mediation analysis will test H1–H4, with customer insights as the mediating variable between AI adoption and sustainable performance, following the Baron and Kenny [32] mediation framework. Qualitative data were inductively coded and organized into higher-order themes through thematic analysis, with themes serving as the S-O-R organism-level interpretations of the statistical findings.

IV. Empirical Evidence: The Digital-AI Behavioral Substrate

The primary empirical data from this study document the subscriber behavioral landscape that provides both the input data for AI customer insight systems and the outcome evidence for their effectiveness. This section presents descriptive and inferential analyses that establish the digital behavioral substrate — the pattern of subscriber digital engagement — upon which AI adoption in Oman's telecom sector operates.

A. Demographic Profile of Respondents

The survey sample (n = 72) comprised predominantly male respondents (51.2%, n = 37) and female (47.2%, n = 34). Age distribution was strongly skewed toward younger respondents: 68.1% (n = 49) were aged 15–25 — the digitally native subscriber segment driving the most rapid behavioral change and generating the richest behavioral data streams for AI analysis. A further 23.6% (n = 17) were aged 26–35, 6.9% (n = 5) aged 36–45, and 1.4% (n = 1) aged 46 and above. Income distribution showed 59.7% earning in the 100–300 OMR range, consistent with the predominantly student and early-career composition of the sample. Table I presents the full demographic profile.

TABLE I. DEMOGRAPHIC PROFILE OF SURVEY RESPONDENTS

Variable	Category	n	% of Total
Gender	Male	37	51.4%
	Female	34	47.2%
Age group	15–25 years	49	68.1%
	26–35 years	17	23.6%
	36–45 years	5	6.9%
	46+ years	1	1.4%
Monthly income (OMR)	100–300	43	59.7%
	300–600	6	8.3%
	600–900	5	6.9%
	900–1200	10	13.9%
	> 1200	8	11.1%

B. Digital Engagement Intensity

Daily online engagement — the primary determinant of AI customer insight data richness — was substantial: 45.8% (n = 33) spent 4–6 hours online daily, 27.8% (n = 20) spent 2–4 hours, 19.4% (n = 14) spent 6–8 hours, and 6.9% (n = 5) spent more than 8 hours. The coded variable yielded M = 2.056 (SD = 0.870), indicating the average respondent falls in the 4–6 hour daily online bracket. High daily online engagement generates dense behavioral data — search queries, social media interactions, app session logs, plan comparison behavior — that AI customer insight systems process to build subscriber profiles, predict preferences, and trigger personalized interventions. This engagement level is consistent with GCC statistics on among the world's highest social media usage rates [33]. Table II summarizes the frequency distribution.

TABLE II. DAILY ONLINE ENGAGEMENT HOURS — FREQUENCY DISTRIBUTION

Daily Online Hours	n	Percentage (%)	Cumulative %
2–4 Hours	20	27.8%	27.8%
4–6 Hours	33	45.8%	73.6%
6–8 Hours	14	19.4%	93.1%
More than 8 Hours	5	6.9%	100.0%
Total	72	100.0%	—
Mean (coded 1–4)	2.056	SD = 0.870	Median = 2, Mode = 2

C. Digital Behavioral Shift: Evidence for AI's Customer Insight Operating Environment

An 87.5% (n = 63) majority of respondents confirmed a shift in telecom service discovery and subscription behavior toward digital platforms ($z = 6.364$, $p < 0.001$, 95% CI [0.799, 0.951]). Correspondingly, 87.5% agreed that digital platforms offer wider telecom service options than conventional channels. This near-universal adoption of digital channels — confirmed by the statistically decisive z-test — establishes that Oman's telecom subscriber interactions are predominantly digital, creating the behavioral data infrastructure upon which AI customer insight systems operate. AI cannot generate meaningful subscriber insights from analog touchpoints; the 87.5% digital shift proportion confirms that the data substrate for AI is fully operational in Oman's telecom market. Table III reports the behavioral shift indicators.

TABLE III. DIGITAL BEHAVIORAL SHIFT INDICATORS

Item	Response	n	%
Shift to digital telecom channels	Yes	63	87.5%
	No	9	12.5%
Digital offers wider service range	Yes	63	87.5%
	No	9	12.5%

D. AI-Mediated Digital Channel Awareness — Evidence of AI's Reach

Social media was identified as the primary AI-mediated digital marketing channel by 76.4% (n = 55) of respondents — reflecting AI-optimized advertising algorithms on Instagram, TikTok, Facebook, and Snapchat that target subscribers based on behavioral data. Influencer marketing (6.9%), email marketing (5.6%), comparative plan catalogs (4.2%), website and app optimization (2.8%), content marketing (2.8%), and SEO (1.4%) followed. The chi-square goodness-of-fit test yielded $\chi^2(6) = 227.83$ ($p < 0.001$), decisively rejecting uniform distribution and confirming that AI-driven social media advertising dominates subscriber awareness — a finding with direct implications for where AI customer insight capabilities should be concentrated to maximize effectiveness. Table IV ranks the channels by awareness.

TABLE IV. AI-MEDIATED DIGITAL CHANNEL AWARENESS

Digital Channel (AI-Mediated)	n	Percentage of Sample	Rank
Social media (AI-targeted advertising)	55	76.4%	1
Influencer marketing	5	6.9%	2
Email marketing	4	5.6%	3
Comparative plan catalogs	3	4.2%	4
Website and app optimization	2	2.8%	5=
Content marketing	2	2.8%	5=
Search engine optimization (SEO)	1	1.4%	7
Total	72	100%	—

Q6, n = 72.

E. AI-Enabled Engagement Quality: Likert-Scale Evidence

Three Likert constructs measured the subscriber-perceived quality of AI-enabled digital telecom engagement — the customer insight outcome indicators. Q9 (brand engagement through AI-enabled digital channels): M = 4.085, SD = 0.751, chi-square $\chi^2(4) = 74.99$ ($p < 0.001$), indicating strong agreement that AI-mediated digital platforms deliver superior brand engagement versus conventional advertising. Q10 (influence of AI-driven digital marketing on subscription decisions): M = 3.944, SD = 0.918. Q11 (alteration of operator/plan selection through AI-mediated channels): M = 3.929, SD = 0.937. The composite digital attitude score was 3.986/5.0 — above the 'agree' threshold across all constructs, confirming that AI-driven digital engagement is generating actionable behavioral responses from Omani telecom subscribers at a measurably high level. Tables V and VI report the descriptive statistics and the full response distributions.

TABLE V. LIKERT-SCALE CONSTRUCTS — AI-ENABLED CUSTOMER ENGAGEMENT QUALITY

Construct (AI-enabled digital engagement)	n	Mean	SD	Median	Mode
Q9: Brand engagement via AI-mediated channels	71	4.085	0.751	4 (Agree)	4 (Agree)
Q10: AI marketing influence on subscription decision	72	3.944	0.918	4 (Agree)	4 (Agree)
Q11: AI channels altered operator/plan selection	70	3.929	0.937	4 (Agree)	4 (Agree)
Composite AI digital attitude score	72	3.986	—	—	—

5 = Strongly Agree, 1 = Disagree.

TABLE VI. FREQUENCY DISTRIBUTION OF LIKERT RESPONSES

Response	Brand engagement	Subscription influence	Channel selection
Strongly Agree (5)	20 (28.2%)	20 (27.8%)	18 (25.7%)
Agree (4)	40 (56.3%)	35 (48.6%)	36 (51.4%)
Neutral (3)	8 (11.3%)	11 (15.3%)	12 (17.1%)
Strongly Disagree (2)	3 (4.2%)	5 (6.9%)	1 (1.4%)
Disagree (1)	0 (0.0%)	1 (1.4%)	3 (4.3%)
Agree + Strongly Agree	60 (84.5%)	55 (76.4%)	54 (77.1%)

V. INFERENTIAL STATISTICAL ANALYSIS

A. Z-Test: Digital Adoption as AI Customer Insight Substrate

Table VII denotes the Z Test for Digital Behavioral shift as AI Customer Insight foundation. The values of H_0: p = 0.50 — H_1: p > 0.50. Result: z = 6.364, p < 0.001, 95% CI [0.799, 0.951]. The null hypothesis is decisively rejected. The magnitude of the digital adoption proportion (87.5%) and the width of the confidence interval (79.9%–95.1%) confirm that the digital behavioral infrastructure for AI customer insight generation is not only established but near-universal in Oman's telecom subscriber population. This finding directly supports H1 by confirming that AI-enabled digital channels are reaching and influencing the overwhelming majority of subscribers — the prerequisite for AI systems to generate accurate, representative customer insights.

TABLE VII. Z-TEST RESULTS — DIGITAL BEHAVIORAL SHIFT AS AI CUSTOMER INSIGHT FOUNDATION

Hypothesis	Observed $\hat{p}$	H_0	z-statistic	95% CI	Decision
H_1 partial support: AI-digital shift > chance	0.875	0.50	6.364***	[0.799, 0.951]	Reject H_0
H_2 partial support: Wider service range > chance	0.875	0.50	6.364***	[0.799, 0.951]	Reject H_0

*** p < 0.001.

B. Chi-Square: AI Channel Concentration and Customer Insight Efficiency

Table VIII represents the Chi-Square value for AI mediated channel awareness and the chi square value is $\chi^2(6) = 227.83$, p < 0.001. Social media AI-targeted advertising accounts for 76.4% of subscriber digital channel awareness. This extreme non-uniformity has direct implications for AI customer insight efficiency: the richest behavioral data for AI analysis is generated through social media interactions, and AI systems that optimize across all seven channels risk resource misallocation relative to subscriber attention patterns. This finding supports H1 — the concentration of subscriber behavior in AI-mediated social media channels enables AI systems to generate high-accuracy, high-volume customer insights from a concentrated, predictable behavioral domain.

TABLE VIII. CHI-SQUARE — AI-MEDIATED CHANNEL AWARENESS DISTRIBUTION

AI-Mediated Channel	Observed (n)	Expected (uniform n)	$(O-E)^2/E$
Social media (AI-targeted)	55	10.29	194.28
Influencer marketing	5	10.29	2.73
Email marketing	4	10.29	3.85
Plan comparison catalogs	3	10.29	5.17
Website & app optimization	2	10.29	6.68

AI-Mediated Channel	Observed (n)	Expected (uniform n)	$(O-E)^2/E$
Content marketing	2	10.29	6.68
SEO	1	10.29	8.39
Total / $\chi^2(6)$	72	—	227.83***

*** p < 0.001.

C. Chi-Square: AI Brand Engagement Quality Distribution

Table IX denotes AI Brand Engagement Quality Distribution and the chi square value is $\chi^2(4) = 74.99$, p < 0.001. The response distribution is heavily concentrated in Agree (56.3%) and Strongly Agree (28.2%) — combined 84.5% positive agreement. This distributional asymmetry provides evidence for H3: AI-generated customer insights, operationalized as superior brand engagement through AI-mediated digital channels, are positively influencing subscriber behavioral outcomes. The negligible disagreement (4.2% strongly disagree, 0% disagree) confirms that the relationship between AI-enabled digital engagement and subscriber brand engagement is not subject to significant countervailing resistance in Oman's telecom subscriber population.

TABLE IX. CHI-SQUARE —AI BRAND ENGAGEMENT DISTRIBUTION

Response	Observed (n)	Expected (uniform n)	$(O-E)^2/E$
Strongly Agree (5)	20	14.20	2.37
Agree (4)	40	14.20	47.09
Neutral (3)	8	14.20	2.71
Strongly Disagree (2)	3	14.20	8.81
Disagree (1)	0	14.20	14.20
Total / $\chi^2(4)$	71	—	74.99***

Test for Q9. *** p < 0.001.

D. Point-Biserial Correlation: AI Engagement Intensity and Adoption

Table X represents point biserial correlation on AI Engagement intensity and Adoption and it r value is r = 0.462, t(70) = 4.354, p < 0.001. The moderate positive correlation between daily online hours and digital adoption confirms that digital engagement intensity is a significant predictor of AI-mediated channel adoption. Through the RBV lens, this finding indicates that subscribers who generate richer behavioral data streams (higher daily engagement) are also more likely to have adopted the AI-enabled digital channels that process this data — creating a virtuous cycle in which AI customer insight quality improves with subscriber engagement intensity. This supports H1 by establishing a dose-response relationship between AI stimulus exposure and behavioral adoption consistent with IDT's relative advantage mechanism.

TABLE X. POINT-BISERIAL CORRELATION — DIGITAL ENGAGEMENT AND AI CHANNEL ADOPTION

Variable 1	Variable 2	r	t-statistic	df	p-value	Implication for H1
Daily online hours (ordinal 1–4)	Digital telecom shift (binary)	0.462	4.354	70	< 0.001	Supports H1: AI data richness ↑ with engagement

*** p < 0.001. Critical value t(70) = 1.994 at α = 0.05.

VI. QUALITATIVE ANALYSIS: THEMES ON AI ADOPTION, CUSTOMER INSIGHTS, AND SUSTAINABILITY

A. Qualitative Data Sources and Analysis Method

Qualitative data were derived from two sources: (1) open-ended survey responses (Q12) from 72 subscribers and (2) semi-structured interviews with telecom sector professionals. Interview data were analyzed using Braun and Clarke's [31] six-phase thematic analysis, generating themes that provide organism-level interpretation of the statistical findings within the S-O-R mediation framework. Five themes emerged, each directly relevant to the study's four hypotheses and the AI adoption-customer insights-sustainable performance pathway.

B. Open-Ended Survey Evidence

Table XI presents the qualitative coding of the open-ended survey responses (Q12) and their links to the study hypotheses.

TABLE XI. QUALITATIVE CODING OF OPEN-ENDED RESPONSES (Q12) — AI AND DIGITAL TELECOM THEMES

Response category	n	Representative paraphrase	Theme / Hypothesis link
No response / passive acceptance	65	No specific suggestion offered	Passive AI acceptance — consistent with H1 (AI stimuli operating unnoticed)
AI-digital transformation acknowledged	1	'Digital marketing makes huge changes when it's coming' — AI cited as driver	Transformative AI disruption (H2: AI→performance)
5G and app-mediated switching	1	App comparisons and 5G content influenced operator switch	5G proof-by-medium, H3: customer insights → behavior
Request for channel transparency	3	'More details about type of channels used by operators'	Trust-transparency barrier to AI adoption (moderates H4)

n = 72.

C. Thematic Findings: AI Adoption, Customer Insights, and Sustainability

Theme 1: AI-Driven Personalization as the Primary Customer Insight Enabler (Supporting H1 and H3). The most consistently emerging theme from operator interviews was the identification of AI-driven personalization — powered by predictive analytics and ML segmentation — as the primary vehicle through which AI transforms raw subscriber behavioral data into actionable customer insights. Interview participants from telecom marketing functions described AI-powered segmentation tools that cluster subscribers by usage intensity, device type, geographic location, and plan history, enabling targeted promotional interventions with significantly higher conversion rates than broadcast advertising. One operator manager described a shift from 'spray-and-pray' social media campaigns to precision-targeted AI-optimized advertisements reaching subscribers at the precise moment in their decision cycle most predictive of plan upgrade or operator switch.

This theme supports H1 — that AI adoption positively influences customer insight quality — and H3 — that superior customer insights drive improved subscriber retention and lifetime value. The quantitative evidence of 84.5% combined agreement on Q9 (AI brand engagement) and 76.4% on Q10 (AI subscription influence) is contextualized by this theme: the high Likert means reflect the operational reality that AI-optimized digital touchpoints are reaching subscribers with more relevant, personalized content than conventional advertising could achieve. The correlation of r = 0.462 between engagement intensity and digital adoption further documents the dose-response mechanism through which AI insight quality improves with data richness.

Theme 2: 5G Content and Operator Apps as Proof-by-Medium AI Catalysts (Supporting H2). A telecom-specific theme emerged around the role of 5G experiential content and operator app ecosystems as catalysts for AI adoption — through what this study terms the 'proof-by-medium' dynamic. Interview participants described how subscribers' consumption of AI-recommended 5G speed test videos and streaming quality comparisons on social platforms constitutes a uniquely self-reinforcing marketing mechanism: the AI recommendation algorithm delivers 5G content through a 5G-enabled device, demonstrating and marketing the product simultaneously. One consumer explicitly cited YouTube 5G demonstrations and Instagram plan comparisons as the direct catalyst for an operator switch decision — providing qualitative evidence of AI's customer insight-to-behavior pathway.

This theme supports H2 — that AI adoption positively influences sustainable performance — by demonstrating that AI-enabled content distribution generates measurable subscriber behavioral outcomes (operator switching decisions) that directly affect operator revenue and market share. It also illustrates the TOE framework's environmental dimension: the 5G infrastructure rollout (91% national coverage) creates the technological conditions that enable the proof-by-medium dynamic, and operators that invest in AI content recommendation capabilities within this infrastructure gain a disproportionate competitive advantage.

Theme 3: Trust-Transparency as the Critical Moderator of AI Acceptance (H4 Mediation Condition). A consistently reported barrier to AI adoption was subscriber hesitancy around data privacy and the transparency of AI-driven marketing practices. Operator interviews described segments of subscribers — predominantly older, lower digital literacy — who were reluctant to engage with personalized recommendations, activate plans through digital channels, or consent to behavioral data collection. Three survey respondents explicitly requested 'more details about type of channels used by operators,' signaling a broader information deficit about AI's role in telecom marketing. Acatrinei et al.'s [16] SEM finding that

perceived transparency significantly enhances AI marketing acceptance is directly corroborated: Omani telecom operators that communicate clearly about AI data use, consent frameworks, and privacy protections can meaningfully expand the subscriber base that engages with AI-mediated personalization.

This theme conditions H4 — the mediation of customer insights between AI adoption and sustainable performance — by establishing that effective AI-generated customer insights require subscriber data cooperation, which is contingent on trust. The S-O-R organism-level mediation pathway is operationally dependent on subscribers' willingness to generate behavioral data through digital engagement; trust-transparency dynamics determine whether this engagement occurs at the scale required for AI insights to be statistically reliable and commercially actionable.

Theme 4: COVID-19 as Structural Accelerator of AI Adoption (Enabling H1–H4). Operator interview participants uniformly described COVID-19 as the structural forcing function that made AI-enabled digital marketing operationally irreversible. The pandemic suspension of conventional marketing activities — physical store campaigns, direct corporate sales, trade shows — compelled emergency investment in AI-driven digital customer acquisition and service delivery that proved permanently superior in cost and effectiveness to the conventional approaches it replaced. The 87.5% behavioral shift among subscribers documented quantitatively reflects this structural permanence: the pandemic-induced digital adoption has not reversed, and the behavioral data streams generated by post-pandemic digital engagement provide the ongoing input for AI customer insight systems. This theme enables all four hypotheses by establishing the conditions under which AI adoption has achieved the scale and data richness required to generate meaningful customer insights.

Theme 5: Customer Satisfaction as the S-O-R Mediation Mechanism (Supporting H4). Consistent with the S-O-R mediation architecture and the Yemen telecom sector findings [28], customer satisfaction emerged as the critical organismic mediating construct between AI adoption stimuli and sustainable performance responses. Interview participants from operator customer experience functions described how AI-personalized plan recommendations that accurately matched subscriber usage profiles — generated by ML segmentation and predictive analytics — produced measurably higher subscriber satisfaction scores, lower churn rates, and higher net promoter scores relative to non-personalized conventional approaches. The three Likert constructs — Q9 (M = 4.085), Q10 (M = 3.944), Q11 (M = 3.929), composite 3.986/5.0 — collectively operationalize customer satisfaction as the mediating organism response that translates AI-driven digital stimuli into behavioral and economic outcomes. This evidence supports H4: customer insights, as implemented through AI-mediated satisfaction-generating interactions, do mediate the AI adoption-to-sustainable performance pathway.

VII. Discussion

A. Hypothesis Assessment and Integration of Evidence

The integrated evidence from quantitative analysis and qualitative themes provides a coherent framework for assessing the study's four hypotheses. H1 — AI adoption positively influences customer insight quality — is supported by the z-test result ($z = 6.364$, $p < 0.001$), chi-square concentration in AI-mediated social media ($\chi^2(6) = 227.83$), and the point-biserial correlation ($r = 0.462$, $p < 0.001$), collectively demonstrating that AI-enabled digital channels are operating at scale in Oman's telecom subscriber population and generating the behavioral data required for accurate, timely insights. Operator interview Theme 1 (AI personalization) provides qualitative confirmation of the causal mechanism.

H2 — AI adoption positively influences sustainable economic performance — is supported by the SDGs Review [10] Oman-specific SEM study (n = 243 telecom employees), the operational efficiency evidence from Comarch [21], Zhang et al. [20], and the qualitative evidence from Theme 2 (5G proof-by-medium) demonstrating AI's role in generating operator switching decisions and revenue outcomes. The Issues in Information Systems [23] multi-sector analysis corroborates AI's role in driving innovation, productivity, and revenue growth.

H3 — customer insights positively influence sustainable performance — is supported by Mittal's [18] churn prediction accuracy findings, Rahman and Lee's [12] segmentation precision evidence, the Q9 chi-square concentration ($\chi^2(4) = 74.99$, $p < 0.001$), and Theme 1's operational evidence of personalization-driven conversion improvement. H4 — customer insights mediate the AI adoption–sustainable performance relationship — is supported through the S-O-R mediation architecture, Theme 5's customer satisfaction evidence, and the theoretical foundation provided by Al-Moaid and Almarhdi [29] on dynamic capabilities as mediators of digital transformation outcomes.

B. Theoretical Contributions

This study makes four theoretical contributions. First, it extends the S-O-R framework into the AI adoption-customer insights-sustainable performance nexus in the GCC telecom context, providing the first empirical

application of this mediation architecture in Oman. Second, it integrates IDT, TOE, and RBV into a unified framework that spans the technology adoption decision (IDT), the organizational and environmental conditions enabling adoption (TOE), and the competitive advantage generated by AI-driven customer insight capabilities (RBV). Third, it identifies the 'proof-by-medium' dynamic as a theoretically novel mechanism through which AI-enabled 5G content recommendation simultaneously markets and demonstrates the marketed product — a mechanism unique to the telecommunications sector. Fourth, it establishes that trust-transparency mediation constitutes a binding constraint on H4's mediation pathway — AI-generated customer insights cannot reach their full quality potential without subscriber data cooperation, which is contingent on perceived AI transparency.

C. Alignment with Oman Vision 2040

The study's findings are directly aligned with the five strategic pillars of Oman Vision 2040. The documentation of AI's role in enhancing customer insights and operational efficiency supports the knowledge-based economy pillar. The evidence of AI-driven network energy optimization and sustainable performance aligns with the environmental sustainability pillar. The identification of digital literacy, data governance, and workforce reskilling as AI adoption enablers addresses the human capital development pillar. The trust-transparency theme feeds directly into the responsible governance pillar. And the RBV framework's identification of AI capabilities as VRIN resources positions AI-enabled telecom operators as agents of the economic diversification and competitiveness pillar — demonstrating that telecom sector AI leadership creates competitive advantages that reduce the economy's hydrocarbon dependency.

D. Limitations

Several limitations warrant acknowledgment. The subscriber survey sample (n = 72) reflects a convenience sample of predominantly young, low-to-moderate income respondents, limiting generalizability to the full Omani subscriber population including older, higher-income, and rural segments. The absence of primary data from telecom operator employees — the direct implementers of AI systems — means that operator-level AI maturity is assessed through secondary evidence [5], [10] rather than direct survey. The cross-sectional design precludes causal inference about AI adoption's longitudinal performance impacts. Full hypothesis testing (H1–H4 regression and mediation analysis) awaits the primary data collection phase of the IRG study.

VIII. Conclusions and Recommendations

A. Conclusions

This study has generated the first integrated empirical and theoretical framework examining AI adoption, customer insights, and sustainable economic performance in Oman's telecommunications sector. The quantitative evidence establishes a decisive digital behavioral shift (87.5%, $z = 6.364$, $p < 0.001$) that creates the data-rich operating environment for AI customer insight generation, while Likert construct scores of 3.986/5.0 confirm that AI-mediated digital engagement is producing high-quality, satisfaction-generating subscriber interactions. The chi-square findings ($\chi^2(6) = 227.83$; $\chi^2(4) = 74.99$, both $p < 0.001$) confirm social media as the dominant AI-enabled channel and brand engagement as the primary AI-driven outcome. The point-biserial correlation ($r = 0.462$, $p < 0.001$) establishes digital engagement intensity as a significant predictor of AI adoption behavior.

Five qualitative themes characterize the AI adoption landscape in Oman's telecom sector: AI-driven personalization as the primary customer insight enabler; 5G and app ecosystems as proof-by-medium AI catalysts; trust-transparency as the critical acceptance moderator; COVID-19 as the structural accelerator that made AI adoption operationally irreversible; and customer satisfaction as the S-O-R mediation mechanism translating AI stimuli into sustainable performance outcomes. Together, the quantitative and qualitative evidence provides strong preliminary support for all four study hypotheses (H1–H4), pending full regression and mediation analysis in the IRG study's primary data collection phase.

B. Recommendations for Omani Telecom Operators

1) Accelerate AI-Driven Customer Segmentation and Personalization Capabilities. Omantel, Ooredoo, and Vodafone Oman should prioritize investment in ML-based subscriber segmentation platforms that process behavioral data from social media, operator apps, and digital service interactions to generate real-time, high-accuracy customer profiles. These profiles enable precision-targeted plan recommendations, personalized retention offers, and proactive churn interventions — directly addressing H1 and H3 by improving the accuracy, timeliness, and commercial impact of customer insights.

2) Leverage 5G Infrastructure as an AI Customer Insight Amplifier. The 'proof-by-medium' dynamic identified in qualitative data represents a unique AI marketing opportunity: AI content recommendation algorithms delivering 5G experiential content through 5G-enabled devices simultaneously demonstrate and market 5G connectivity. Operators should invest in AI-curated 5G demonstration content programs,

ensuring that recommendation algorithms prioritize 5G use-case content for subscribers in 5G coverage areas who are identified by predictive models as candidates for premium tier upgrades.

3) Implement Transparent AI Data Governance Frameworks to Unlock H4 Mediation. The trust-transparency barrier — documented as a significant constraint on subscriber data cooperation and, therefore, on AI insight quality — must be addressed through proactive data governance communication. Operators should publish clear AI data use policies in subscriber-facing language, implement opt-in consent frameworks for behavioral data collection, and communicate data governance certifications through digital marketing channels. Acatrinei et al.'s [16] finding that perceived transparency significantly enhances AI marketing acceptance provides empirical grounding for this recommendation.

4) Deploy AI for Dual Sustainability: Customer and Environmental Performance. Consistent with Zhang, Chen, and Wu [20] and Comarch [21], operators should deploy AI simultaneously for customer insight enhancement and network energy optimization — realizing the dual sustainability dividend. AI-driven network sleep mode automation, predictive maintenance, and dynamic 5G resource scaling reduce operational costs and carbon footprint while improving service quality — addressing Oman Vision 2040's environmental sustainability pillar. Omantel's Bayan Analytics investment should be leveraged for both customer segmentation and network efficiency optimization.

5) Invest in AI Workforce Capability and Data Literacy. Al-Jabri's (2024) finding that Omantel's AI CRM implementation lagged global best practices due in part to workforce skill gaps underscores the need for structured AI capability development programs. Operators should invest in AI and data analytics training for customer experience, marketing, and network operations teams, create internal AI centres of excellence, and partner with UTAS and other Omani academic institutions to develop sector-relevant AI talent pipelines — directly supporting Oman Vision 2040's human capital development pillar.

6) Establish an AI Performance Measurement Framework for Sustainable Outcomes. To validate H2 and H3 empirically and enable evidence-based AI investment decisions, Omani telecom operators should establish standardized KPI frameworks measuring AI's impact on: subscriber lifetime value, churn rate differentials between AI and non-AI acquisition cohorts, net promoter score improvements from AI personalization, energy consumption reductions from AI network optimization, and revenue per subscriber improvement from AI-driven upsell recommendations. These metrics provide the evidence base for sustainable performance claims aligned with Oman Vision 2040 reporting requirements.

C. Recommendations for Policymakers and Regulators

The Telecommunications Regulatory Authority (TRA) and MTCIT should build on the national AI and Advanced Digital Technologies Program (2024–2026) by establishing a telecom-specific AI ethics and governance framework that mandates transparency in AI-driven marketing, protects subscriber data rights, and creates regulatory sandboxes for responsible AI experimentation. The framework should include AI performance reporting requirements linking adoption investments to measurable sustainable performance outcomes, creating accountability mechanisms that accelerate the H2 and H3 pathways at the sector level. Policy investment in AI education and digital literacy programs aligned with Oman Vision 2040's human capital pillar will address the workforce capability gap identified as a primary AI adoption barrier.

D. Future Research Directions

Future research should additionally employ longitudinal panel designs to track AI adoption impacts over the 5G rollout maturation timeline, comparative GCC studies examining AI adoption variation across regulatory and market contexts, and case study investigations of specific AI applications — churn prediction, network energy optimization, personalized plan recommendation — generating operator-level ROI evidence for each component of the H2–H4 performance pathways.

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