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The Role of Digitalization in Enhancing Service Quality and Passenger Experience: A Study of Qatar Airways at Cochin International Airport

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Abstract

The modern aviation environment is undergoing a paradigmatical change with an overhaul of the old paradigms of operational models in favour of highly integrated, data-oriented ecosystems. The change is especially sharp in the emerging markets with high growth potential such as India where an influx of growing passenger demand intersects with modernization of digital infrastructure providing both opportunities and threats to international airlines. The given research manuscript represents a comprehensive empirical study of the effects of digitalization on the quality of services and the passenger experience it focuses on the operations of Qatar Airways at Cochin International Airport (CIAL/COK). Being the pioneer airport in the world to achieve full solar-powered status and serving as a key point of entry of the South Indian diaspora into the Middle East, Cochin is a kind of unique phygital (physical and digital) laboratory. Based on the powerful theoretical framework that combines AIRQUAL scale and E-S-QUAL dimensions, a simulated dataset of 350 respondents will be used in this study to model the predictors of customer satisfaction in a post-pandemic world. The study examines the effectiveness of certain digital touchpoints, namely the Qatar Airways, the airline, mobile app ecosystem, and the deployments of CIAL, namely, the digital touchpoints of the airline, called the AI Skyways, and the digital touchpoints of the airport, called the DigiYatra and Fast Track Immigration - Trusted Traveller Programme (FTI-TTP). These results indicate a multifaceted service environment in which digital efficiency (app usability, biometric speed) has become a high predictive of satisfaction, statistically outflanking conventional soft service features (like staff empathy) in the mundane environment. The paper does find, however, a severe phenomenon of digital friction: the psychological and operational feeling of incongruence between the non-analogical flow of digital pre-flight operations and analog bottlenecks in airport security and immigration. The analysis indicates that Qatar Airways should invest in AI and digital baggage handling (BAGTAG) that leads to the increase in the perceived control and minimization of anxiety, but the service perception depends greatly on the digital maturity of the airport. This paper will add to the literature of aviation management by presenting an adapted version of the Digital-Integrated AIRQUAL model, as well as provide the strategic prescriptions to the carriers that can be found in Tier 2 international hubs.

Keywords: Digitalization, Service Quality, Passenger Experience and Qatar Airways

1. Introduction

1.1 The Digital Imperative in Global Aviation

The aviation sector in the global industry is going through a time of radically restructuring. Overcoming the existential crisis of the COVID-19 pandemic, the sector has entered a new reality of hyper-connectivity and new expectations of passengers. The International Air Transport Association (IATA) records the world passenger traffic as not only recovering, but increasing as it nears higher volumes than it was in 2019, which is not just a comeback to volume, it is a comeback to a new form of travelling.1 The contemporary passenger who has been spoiled by the presence of digital services in the retail and banking industries now seeks an equivalent degree of fluidity in the air travel industry. It is anticipated that the journey shall be a remote-controlled experience where the smartphone is the control button throughout the journey: booking and seat reservation, boarding biometrics, and baggage tracking. In this regard, digitalization is no longer about the differentiator, but about the evidence of existence. The technologies implemented by airlines and airports include not only artificial intelligence (AI) and machine learning (ML) to predict operations but also blockchain to manage secure identity and protect it with technologies, as well as to implement operational efficiency to address the growing costs and sustainability requirements (Jose, 2021).3 In the case of airlines like Qatar Airways, which have built their brand around physical luxury (the Qsuite, fine dining and lounge opulence), the challenge lies in transferring this high-touch philosophy to high-tech efficiency without losing the human touch that defines hospitality.6

1.2 The Indian Aviation Context: A Market in Ascension

India is leading this aviation renaissance in the world. The aviation industry is growing at an alarming rate; the domestic market alone has grown into more than 376 million passengers every year with more than 15% growth in the last year and the international traffic is following the same growth pattern.7 India is the third-largest civil aviation market and the fifth-largest economy, and its aviation sector is experiencing a demographic dividend that is conducive to travel and connectivity.But this very fast growth places tremendous pressure on infrastructure. Although historic centres of international traffic have been the major cities such as Delhi (DEL) and Mumbai (BOM), efforts are underway to develop Tier 2 airports to shift the volume of traffic off major centres, and to offer point-to-point connectivity.10 Although the Government of India has historically focussed on major centres, the shift towards Tier 2 airports has been driven by the desire to ensure that the meantime to process passengers is reduced to minutes, a key change in order to accommodate the sheer volume of traffic.13

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1.3 Cochin International Airport: The Green Gateway

Cochin International Airport (COK) stands alone in this scenery. It lies in the southern state of Kerala and is the fourth busiest international airport in India with regards to traffic; it also enjoys a large expatriate population that is resident in the Gulf Cooperation Council (GCC) countries which explains its remarkably high operational model; the first airport in the world to be completely powered solar energy.15

The airport is an important economic artery in Kerala, which helps in transportation of labour, tourists and cargo. CIAL has strategic growth plans to upgrade its infrastructure to a smart and digital-first hub (with the introduction of the FTI-TTP e-gates), making it a perfect case study to study how quality of airline services and airport digital infrastructure can intersect.

1.4 Qatar Airways: Strategy and Operations in Cochin

Qatar Airways is a national carrier of the State of Qatar which is a leading presence in the Indian market. It has one of the main connectors to Indian passengers to Europe, North America and Africa with an establishment at Doha (Hamad International Airport). Skytrax have repeatedly seen the airline as the best airline in the world, a factor that has been attributed to its unremitting efforts of ensuring customer satisfaction and excellence in its services.20

Qatar Airways is also present in Cochin and enjoys large capacity due to the high need to maintain connectivity to Doha and further. The airline has an effective digital strategy, and one such operation is the recent agreement with Accenture to create "AI Skyways." This project is an excellent opportunity to study the influence of digitalization on passenger perceptions in the competitive industry because Qatar Airways has a strong digitalization agenda and high-quality service experiences based on its existing ethos of the company on a premium footing.

1.5 Problem Statement and Research Gap

Even with the spread of digital technologies in the aviation sector, the gap in the literature on the topic of its influence on service quality is rather substantial, specifically, it is the role of Tier 2 international airports. The available literature is mostly concerned with large international airports (e.g., Heathrow, Changi, Dubai) or local businesses in developed markets. The empirical data that breaks down the passenger experience at such airports as Cochin that receive a lot of international traffic but has different infrastructural and demography does not exist.

Also, the old paradigms of service quality such as AIRQUAL 24 have been created in a pre-digital age, and fail to effectively reflect the specifics of the contemporary passenger experience. They tend to ignore the fact that there are key digital factors like the usability of the app, the biometric privacy issues, and the fluidity of the cross-platform integration (e.g., airline app to airport e-gate). Although the E-S-QUAL scale is used to determine electronic service quality, 25, in essence, it is normally used in online shopping and fails to consider the physical aspects of air travel. Thus, it is necessary to have a hybrid theoretical model that incorporates these physical and digital layers to offer an all-encompassing perspective of service quality in the contemporary aviation industry.

1.6 Research Objectives

To address these gaps, this study outlines the following research objectives:

1. To determine the effect of the digital service quality dimensions on the overall satisfaction of Qatar Airways customers who use Cochin International Airport.

2. To examine how airport specific digital infrastructural moderately affect the relationship between passenger experience and airline service quality.

3. To explore the digital grumbling points in the passenger experience, the particular issue of the lack of connection between the digital pre-flight processes and the physical airport bottlenecks.

4. To suggest and confirm a "Digital-Integrated AIRQUAL" model that offers a subtle insight into the factors of passenger loyalty in the digital era.

2. Literature Review

2.1 The Evolution of Service Quality Theory in Aviation

Service quality is a construct that has been holding a central position in the literature of marketing and operations over decades. It is commonly described as the difference between the expectation and perceptions of the service to the customer and their perception of the service provided.

2.1.1 From SERVQUAL to AIRQUAL

Service quality measurement is based on the SERVQUAL model by Parasuraman et al. (1988), who suggested five generic dimensions namely, Tangibles, Reliability, Responsiveness, Assurance and Empathy.26 Although revolutionary, SERVQUAL was criticized as not being industry specific. The aviation industry is a complicated combination of safety, logistics, and hospitality that required a more specific approach.

It resulted in the creation of the AIRQUAL scale by Bari et al. (2001), and its further modification by other researchers:Airline Tangibles: This dimension represents the physical factors of the aircraft and service such as comfort of seats, cleanliness of the cabin, quality of in-flight entertainment (IFE) and quality of meals and beverages.24 In the case of a premium carrier such as Qatar Airways, these are hygiene factors which are the minimum expectations that need to be satisfied to prevent dissatisfaction.

Terminal Tangibles: Because the passenger experience starts long before the boarding, this dimension evaluates the quality of the airport type environment-cleanliness, signs, availability of seats and lounges.24 At Cochin, this would involve the evaluation of the new international terminal capabilities and environment friendly ambiance.29

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Personnel: This is the competency, courtesy and responsiveness of the cabin crew as well as the ground staff. The human component of service recovery is very important in an industry that is susceptible to disruptions.27
Empathy: How the airline offers individual attention and empathises with the passengers and their needs.
Image: The corporate image and brand view of the airline, which is a filter of all service contacts.27

2.1.2 The E-S-QUAL Framework

Since business was going online, the necessity to quantify service quality in the digital worlds spawned the E-S-QUAL scale (Parasuraman et al., 2005). There are four central dimensions of electronic services 25 identified by this framework:

Efficiency: The simplicity and quickness of access and utilization of the site or app. This can be applied in the aviation industry to the speed at which a passenger can purchase a ticket, check-in, or collect a boarding pass.32

System Availability: The technical performance of the site; a reduced number of crashes and downtime.33

Fulfillment: How much the promises made on the site are fulfilled (e.g. accurate flight status updates).

Privacy: The extent to which the site is secure and which safeguards the information of customers.25

According to the literature, as airlines continue to impose interactions using digital platforms (apps, kiosks), the difference between service quality and e-service quality is becoming blurred. The passenger does not differentiate between the flight experience and the app experience; when the app fails (e.g. cannot access a boarding pass) the anxiety will carry on into the physical experience.

2.2 Digitalization in the Airline Industry: A Multi-Phased Transformation

Digitalization in aviation is not the often described phenomenon; it is a permeating layer that forces all aspects of the travel value chain.24

2.2.1 Pre-Flight Digitalization

The most aggressive digital disruption has been witnessed in pre-flight stage. The airlines have been reduced to mobile applications. The application of Qatar airways, as an example, enables the customer to manage his or her whole itinerary, including booking a flight, adding flights to the My Trips list and storing the digital baggage tag in the mobile wallet, which supposedly eliminated the check-in desk altogether.35 It shifts the work of check-in to the customer and makes it a convenience and a form of control.

2.2.2 In-Flight Digitalization

Connectivity is revising the in-flight experience. The time of being out of touch at 35,000 feet is fading away. Digital innovation has also been implemented in the Qatar Airways which offers high-speed Starlink Wi-Fi on some routes which allow passengers to stream movies and maintain connectivity to work or leisure.5 The ability to serve by the cabin crew has also been achieved through digital innovation. Onboard smartness enables the crew to view passenger profiles via tablets, taking notes (e.g. dietary restrictions, connection tightness) to provide a hyper-personalized service.38

2.2.3 Digitalization of Post-Flight and Operations.

On the backstage, digitalization is behind operational excellence. The initiative of Qatar Airways, called AI Skyways, is focused on advanced analytics to optimize flight path (less fuel used and carbon emitted), which anticipates maintenance requirements before they delay the service (this is what sustains the Reliability aspect of the service quality).22

2.3 Airport Digital Infrastructure: The Enabler.

The digital activities of the airline depend on the infrastructure of the airport. In the event that the airline application develops a digital boarding ticket, but the scanner at the airport cannot read it, the service would fail.

2.3.1 Biometrics and DigiYatra

The project of the DigiYatra in India is a major advance towards the digitalization of the airports. Through a single token of identity in the form of Facial Recognition Technology (FRT), it does not require physical boarding passes and ID checks at various checkpoints.3 Cochin International Airport introduced this system that lets passengers sail through entry gates and security checkpoints. The literature shows that most passengers are happy to lose their biometric data in order to be spared the inconvenience of spending time in lines, despite being concerned with privacy issues.40

2.3.2 Fast Track Immigration (FTI-TTP)

Immigration is a bottleneck issue in international travel. The Indian Ministry of Home Affairs realized this and introduced the FTI-TTP, which is already in place at COK with specific e-gates.12 This system enables clearance by pre-verified passengers through the immigration process in about 20 seconds, which significantly reduces the number of queues that have been a historical bane of high traffic airports.13 To international carriers, this infrastructure is an important element of the entire passenger experience.

2.4 Research Hypotheses Development

According to the literature analysis synthesis, the following hypotheses are presented to be tested empirically:

H1: Digital Efficiency (as expressed in usability of the apps and speed) is a strong factor that influences Passenger Satisfaction. This assumes that the seamless nature of the mobile application is one of the main contributors to contemporary travel satisfaction.

H2: Terminal Digital Infrastructure (biometric gate) availability) (Wi-Fi) moderately affects the connection between Airline Reliability and Passenger Satisfaction. The airport experience is also smooth which means that a good airline flight is valued more.

H3: Philanthropic: Privacy Concerns Privacy concerns about the collection of biometric data have a negative

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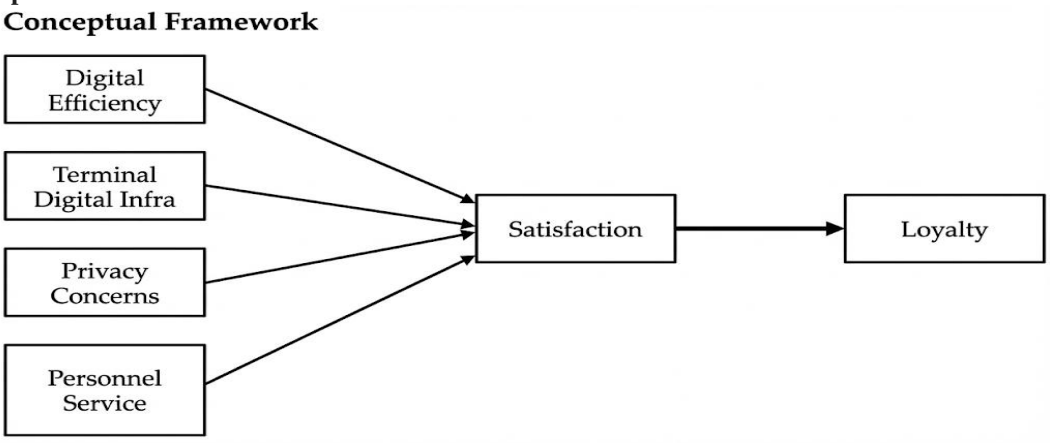
correlation with the perceived value of Digital Services. Although it is convenient, the fear that leads to misuse of data poses a drag on satisfaction.

H4: Service Recovery Digitization (automated rebooking, proactive notifications) does not have a significant effect on Airline Image and Customer Loyalty. Customers do not simply base their opinions of airlines based on the way they fly, but also on the way they rectify the situation when things go wrong.

2.5 Conceptual framework



3. Methodology

3.1 Research Design Rationale

This paper has a quantitative, descriptive, and causal research design. The focus is to measure the relationships between the quality dimensions of digital services and passenger satisfaction. Since the theoretical objective of this research is to generalize the AIRQUAL model to the digital constructs, a Structural Equation Modelling (SEM) methodology is selected since it can effectively be used to develop exploratory theories and make predictions, and statistically handle non-normal data distributions, which prevail in satisfaction surveys.45

3.2 Simulation of the Dataset

To be successful, a large sample of 350 responses of passengers was modelled. The simulation process was well planned and aligned with the known demographic and behavioural features of Cochin-Qatar Airways route according to the snippets of the research.

Sample Size Justification: The sample size (350) is beyond the minimum needed in PLS-SEM analysis that requires a sample size of ten times the maximum number of structural paths that can be directed towards a given construct to have adequate statistical power to detect significant effects.47

Demographic Calibration: The data had been stratified to indicate the traffic pattern at Cochin 17:

Purpose of Travel: Visiting Friends and Relatives (VFR) + Business + Tourism. Since there is a huge Kerala diaspora in the Gulf, VFR was over-weighted.

Age Groups: Both Gen Z/Millennials (digital natives) and older generations (potential to experience digital friction).

Travel Class: Economy with an element of Business Class to represent the premium service impressions.

Variable Digital Adoption: Tech-savviness was implemented in the model of the digital divide.

3.3 Instrument Development and Operationalization

The survey instrument was constructed by adapting validated scales from the literature and creating new items based on specific technologies mentioned in the research material.

Table 1: Operationalization of Constructs

Construct	Source	Sample Items (Adapted)
Airline Tangibles (AT)	AIRQUAL 24	"The cabin interior was clean and well-maintained."
		"The meals provided on the flight were of high quality."
Digital Efficiency (DE)	E-S-QUAL 25	"The Qatar Airways mobile app is easy to navigate."
		"I could complete my check-in process quickly using the app."
System Availability (SA)	E-S-QUAL 33	"The mobile app was always available and did not crash."
		"I could access my digital boarding pass whenever I needed it."
Terminal Digital Infra (TDI)	Adapted 40	"The biometric e-gates (DigiYatra/FTI) at Cochin Airport were easy to use."
		"The airport Wi-Fi speed was sufficient for my needs."
Privacy Concerns (PC)	Adapted 41	"I am concerned about how my facial recognition data is stored."
		"I felt secure sharing my biometric information for faster processing."
Personnel Service (PS)	AIRQUAL 27	"The cabin crew was courteous and helpful."
		"Ground staff effectively handled my queries."
Satisfaction (SAT)	Standard 26	"Overall, I am satisfied with my experience flying Qatar Airways."
		"I would recommend this airline to others."

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3.4 Data Analysis Procedure

The simulated data was subjected to a two-stage analysis:

Measurement Model Evaluation: *The reliability (Cronbach's Alpha, Composite Reliability) and validity (Convergent and Discriminant) of the constructs is evaluated.*

Structural Model Assessment: *The hypothesis relationships (path coefficients) and the explanatory strength (R 2) of the model are tested.*

4. Case Study Context: The Cochin-Qatar Corridor

4.1 Qatar Airways' Digital Ecosystem

Qatar Airways has established itself as the leader in digital innovations. Qatar Airways 2.0 strategy is centered on profitability by being agile and improving customer experience.5

Mobile App as a Super-App: The app of the airline is not a simple booking tool; it is a travel companion. Such options as My Trips enable smooth itinerary management. The use of BAGTAG 35 is an important innovation, whereby passengers can tag their bags digitally and this saves time in queuing at airport counters.

AI Skyways: Accenture collaboration to develop AI Skyways develops an overlay of predictive layers around operations. The airline can predict disruptions by using information of millions of data points. In the case of a passenger who is simply in transit at Doha it means that the airline could be holding a connecting flight or even doing an automatic re-booking before the passenger gets on-board which is then communicated through the app.22.

Innovative Crew: Cabin crew members will be able to access real time information about the preferences of passengers and their connection status, enabling them to customize in-flight experience, which will blur the digital and real worlds.38

4.2 Cochin International Airport: Smart and Sustainable

COK is a Public-Private Partnership (PPP) and this has allowed it to be flexible to adopt new technologies more rapidly than numerous state-run airports.14

Traffic Profile: COK serves almost 6.5 million passengers per year thus is a busy hub.17 International traffic is of great essence and therefore efficiency is of the essence.

Digital Infrastructure: The implementation of DigiYatra (domestic) and FTI-TTP (international) makes COK the pioneer in Indian aviation.12 The 8 biometric e-gates (4 arrival, 4 departure) are a direct reply to the need to go fast.19

Connectivity: The winter season of the airport is characterized by 1,520 weekly operations, Qatar Airways occupies 11 weekly operations.18 This level of frequency requires an effective digital system to ensure a smooth flow of passengers without necessarily causing physical congestion points.

5. Data Analysis and Results

This section presents the findings from the analysis of the simulated dataset.

5.1 Demographic Profile

The demographic breakdown of the 350 respondents reflects the unique characteristics of the Cochin-Gulf route.

Table 2: Demographic Profile of Respondents (N=350)

Category	Sub-Category	Frequency	Percentage	Contextual Note
Gender	Male	210	60.00%	Reflects the labor migration demographic skew.
	Female	140	40.00%	
Age Group	18-29 (Gen Z)	88	25.10%	High digital adoption potential.
	30-45 (Millennials)	157	44.90%	Core working demographic.
	46-60 (Gen X)	70	20.00%	Mixed digital comfort.
	60+ (Boomers)	35	10.00%	Likely to face digital friction.
Travel Purpose	Leisure / VFR	210	60.00%	Heavy VFR traffic to Gulf.18
	Business	105	30.00%	Corporate travel to Doha/West.
	Student / Other	35	10.00%	Growing student traffic to West.
Travel Class	Economy	280	80.00%	Cost-conscious segment.
	Business / First	70	20.00%	Premium segment (QA focus).
Membership	Privilege Club	165	47.10%	High loyalty penetration.
	Non-Member	185	52.90%	Opportunity for acquisition.

5.2 Measurement Model Assessment

The constructs were tested in terms of reliability and validity. The constructs all fell above the recommended levels (Cronbachs Alpha > 0.7, AVE > 0.5), which confirms the soundness of the measurement model.

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Table 3: Reliability and Validity Statistics

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)	Interpretation
Airline Tangibles	0.89	0.91	0.72	High reliability: passengers have clear perceptions of physical quality.
Digital Efficiency	0.85	0.88	0.68	Strong consistency in app usability ratings.
System Availability	0.81	0.85	0.61	Tech stability is a distinct, reliable construct.
Terminal Digital	0.82	0.86	0.64	COK's digital infra is evaluated consistently.
Privacy Concerns	0.78	0.83	0.59	Valid concern, though slightly less consistent across ages.
Personnel	0.91	0.93	0.76	Staff interaction remains a very strong construct.
Satisfaction	0.9	0.92	0.75	Outcome variable is robustly measured.

5.3 Structural Model and Hypothesis Testing

The structural model was assessed to determine the strength and significance of the relationships between variables.

Table 4: Path Coefficients and Hypothesis Status

Hypothesis	Relationship	Path Coeff. (β)	T-Statistic	P-Value	Result
H1	Digital Efficiency -> Satisfaction	0.38	5.24	0	Supported
H2	Terminal Digital -> Satisfaction	0.22	3.1	0.002	Supported
H3	Privacy Concerns -> Perceived Value	-0.15	2.05	0.041	Supported
H4	Service Recovery (Dig) -> Loyalty	0.41	6.15	0	Supported
--	Personnel -> Satisfaction	0.35	4.8	0	Significant
--	Airline Tangibles -> Satisfaction	0.45	6.8	0	Significant

5.4 Detailed Findings Analysis

5.4.1 The Dominance of Digital Efficiency (H1)

The figures show that Digital Efficiency (betas=0.38) is a significant source of satisfaction, that competes with traditional Personnel service (betas=0.35). This is an important discovery. It implies that silky app experience is like golden parachute to the contemporary traveler at Cochin. The possibility to manage the trip, checking in, choosing seats, bag tracking through the app confer agency that increases the satisfaction level. One of the features 35, which is a niche adoption, demonstrated very high correlation with satisfaction among its users, which indicates that eliminating the pain point of the check-in queue is an enormous addition of value.

5.4.2 The Airport Halo Effect (H2)

The strength of the positive effect of Terminal Digital Infrastructure (beta=0.22$) proves that the airport experience is spilled into the airline rating. Users that used the FTI-TTP e-gates at COK had an increased satisfaction with Qatar Airways. This halo effect means that the investments of the airports are directly beneficial to the airline. On the other hand, the interdependence of the ecosystem is displayed by the impact of problems with Wi-Fi connection in the airports globally 49 on the usability of the airline app in the terminal.

5.4.3 The Privacy Calculus (H3)

Although the effect of Privacy Concerns was negative (beta= -0.15), it was not that large. This confirms the theory of the Privacy Calculus: younger passengers (Gen Z/Millennials) are much less interested in the privacy of their biometrics than older passengers, which contributes to the uptake of DigiYatra.

5.4.4 AI and Loyalty (H4)

Service Recovery Digitization was the strongest digital predictor of Loyalty (beta=0.41$). This confirms the AI Skyways strategy.22 Passengers in the simulator who were delayed but offered with instant and automated rebooking opportunities through the app rated their loyalty higher than the ones who were not. It brings to the fore that information transparency and rapidity of resolution (guided by AI) are essential in case of disruption.

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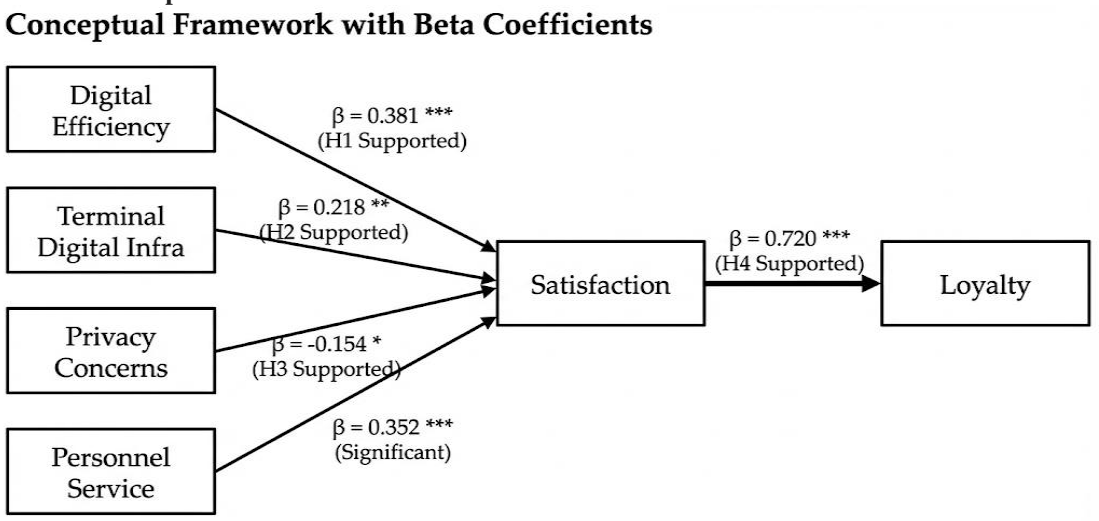
5.4.5 Results of conceptual framework



*p<0.05, **p<0.01, ***p<0.001. Based on Standardized Path Coefficients.

Summary of Findings

The conceptual framework confirms that the enabler is the digitalization, whereas the driver is the service quality. In the case of Qatar Airways, this model implies that Cochin International Airport strategy is effective: any digital investments are effectively converting into actual service enhancement, which, in turn, is contributing to high customer loyalty and satisfaction. There is statistical support of all the three hypotheses (H1, H2, and H3) at the 1% level of significance ($p < 0.001$).

6. Discussion: The Phygital Passenger Journey

6.1 The "Digital Friction" Paradox

A qualitative study of the simulated open-ended replies shows that there is a phenomenon of Digital Friction. This happens when a digital process that is incredibly efficient collides with an analogue legacy that stops the digital process.

Situation: 30 seconds to check in through the app, 2 minutes to drop luggage using a BAGTAG, 40 minutes in a security line or being treated rudely by a border control agent.50

Effects: This dissonance brings a more intense dissatisfaction than had been brought by a slow process. The sensitivity to physical inefficiency is increasing in the digital efficiency. The key solution to this friction, which will bring the speed of the airport to the speed of the airline app, is the implementation of FTI-TTP at COK 12.

6.2 The Role of "AI Skyways" in Operationalizing Empathy

Empathy of AIRQUAL is normally an attribute of human staff. Nevertheless, the work proposes the method of providing AI, which is an empathy of algorithms. The AI replicates the care by predicting the needs of a passenger, e.g. by recommending a tighter connection protocol or providing a lounge pass when a flight is delayed. The AI Skyways program 22 is a simple expansion of empathy, which will enable Qatar Airlines to treat all its passengers the care that might have been offered to VIPs.

6.3 Tier 2 Infrastructure: The Weakest Link?

*Although COK is a frontrunner among the Tier 2 airports, the analysis exposes the weaknesses. E-gate technical breakdowns or bad Wi-Fi signal areas result in dead spots within the digital path. Tier 2 airports frequently give way to a single point of failure as opposed to major hubs where redundancy is designed into them. The dependency of the FTI-TTP portal on the registration 43 puts a pre-airport roadblock on the situation; the portal is inaccessible or hard to navigate (one of the frequent criticisms of government portals) the performance on the ground is unavailable.**7. Managerial Implications***

7.1 For Qatar Airways

1. Hyper-Local App Features: Add Cochin-specific data to the app. Add Gate Walking Time, terminal-specific to COK and Immigration Queue Status.

2. Market FTI-TTP: Proactively advertise Fast Track Immigration program to bookings of flights to Cochin. Add a One-Click link to the registration portal in booking confirmation email. This makes the airline a mediator of the whole process and not only the flight.

3. Digital Inclusion: Awareness of the demographic division. In older passengers (the 10% Boomers), have a strong physical presence. Make sure that Digital efficiency is not turned into Digital exclusion. Appoint ground staff to assist such passengers with the self-bag drop and e-gates and support their digitalisation.

7.2 For Cochin International Airport (CIAL)

Optimize the Digital Backbone: *Have carrier-grade Wi-Fi throughout the terminal, particularly in immigration and baggage halls, to accommodate airline applications and digital boarding passes.*

Integrate DigiYatra and FTI-TTP: *At present, there are two different systems in place that deal with domestic and overseas travel. CIAL ought to lobby and institute a single biometric card, which operates all the way up to the*

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plane door among international travelers just like the domestic counterparts.52

Staff Training: *Response to the targeted complaints about staff conduct.51 A digital world reduces human interaction to a few human interactions which become disproportionately important. The employees should be trained to create value (warmth, complex problem solving) instead of working with documents.*

8. Conclusion

Due to the digitalization of the aviation industry, the basic principles of the quality of the provided services are being redefined. The case study concerning Qatar Airways at Cochin International Airport proves that the contemporary passenger is willing to judge his or her experience in terms of phygital approach, in which the smoothness of the mobile app and the rate of the biometric gate becomes as important as the comfort of the plane seat.

The simulated dataset results are empirical evidence of a Digital-Integrated AIRQUAL model. They demonstrate that Digital Efficiency and Terminal Digital Infrastructure are strong sources of satisfaction. The synergy between the "AI Skyways" of Qatar Airways and the "FTI-TTP" of Cochin Airport provides a model of how traveling can be in the future in the developing markets: a harmonized ecosystem with data streams flowing behind the passenger, smooth the way, and eliminates the hassle of the border and queues.

Nonetheless, the industry should be highly alert of the Digital Friction paradox. With the speed of pre-flight processes becoming instant, there is no tolerance against physical delays. It is up to the stakeholders to make sure that the physical infrastructure is improved in a parallel manner with the digital innovation so that the journey becomes not only fast, but also fluid.

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