

A STUDY ON DIGITALIZATION AND ITS EFFECT ON CUSTOMER SATISFACTION IN INDIAN RAILWAYS

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ABSTRACT

With globalization and invent of new technology, economy of the country has been featured by lightning-fast technology and real time updation and has been widely recognised as one of the fastest growing countries of the world. Indian railways rank as IVth largest railway network in the world by size and connects all the corners of the country. Growth of economy and education level has increased the expectation of consumers of Railways expect real time update and innovative services for better satiety. Advancement of technology has made it possible to avail allied services in cost effective economical manner which has added to the experience of the customers. Various services have been offered by Indian railways such as introduction of online apps e.g., 'IRCTC' and 'Meals on Wheels' which provide allied real time services. Thus, Cloud technology and Digitalization have become the present and future of the Indian Railways. Till date many studies have been conducted to explore the benefit of cloud technology and digitalization on customer satisfaction of Indian Railways but not much research work has been conducted till date. This is empirical research to analyse the cloud technology and digitalization on customer satisfaction of Indian Railways.

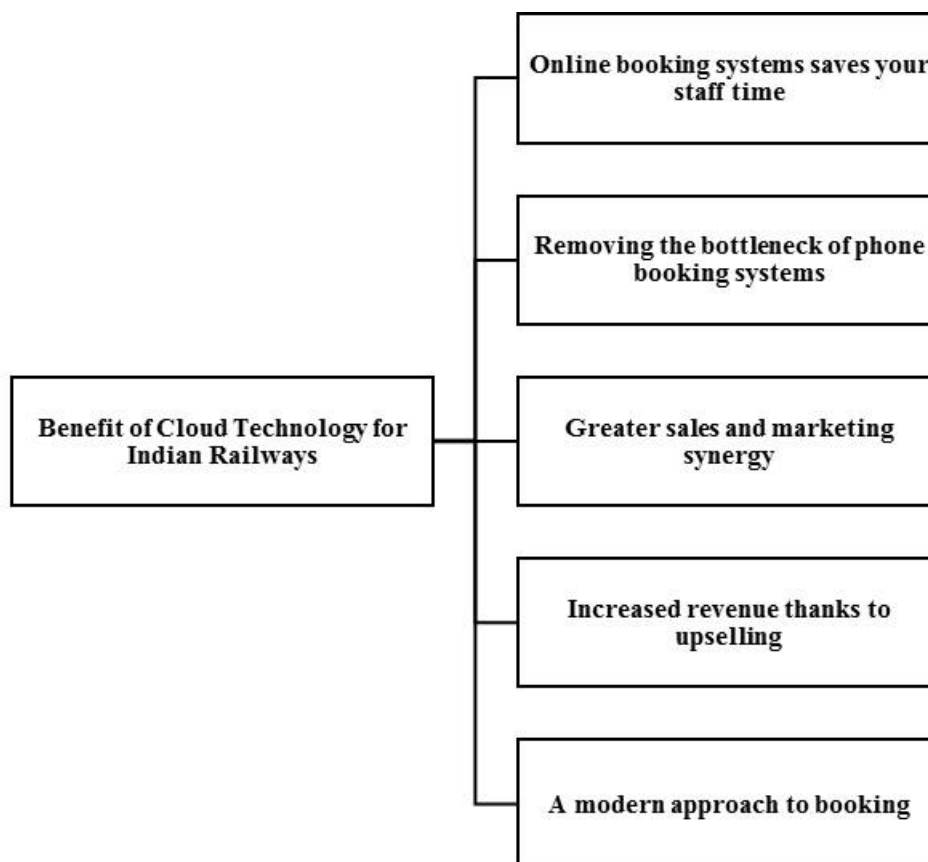
Keywords: Indian, Railways, Cloud technology, Digitalization, Customer satisfaction, Real time, Technology

1. Introduction

"Indian Railways is a government-owned-railway system under the ownership of Ministry of Railways, Government of India that operates India's national railway system. It manages the Fourth-largest railway network in the world by size, with a total route length of 126,511 km as of 31 December 2021". It is the basic means of transportation of the country ranking as the second rank in terms of largest population, which explains the wide usage of the rail transportation throughout the country. With introduction of various types of trains with different speeds and services, usage of such means of traveling is becoming more and more passenger friendly. Apart from increased usage by passenger, trains are also one of the most preferred means of transportation of heavy and bulky materials. Still many areas are there in the country which don't have ready connectivity of highways and even roads but trains manage to touch such areas too. Of late modernization of country have hiked the expectation of customers of Indian railways. Growth of allied businesses in the country demands for speedy services and real time updation along with various other value-added services (e.g., Chen et. al., 2007). More specifically consumers expect services such as online food ordering and the booking of cabs before reaching the destination, which is made possible by cloud technology and

digitalization. These services not only provide the consumer with various services but also saves their valuable time and rules out contingencies. Availability of real time services increases the satiety of experience of customers availing the services of railways. Digitization on the other hand brings such value-added services on the tips of consumers (e.g., Parasuraman et al., 2005). Enhanced 'Graphic User Interface' enables the consumers from all the background to easily use such services (e.g., Eid ET.AL., 2011). Moreover, Indian railways also offer the digitised cloud computing services in various regional and foreign languages too which has further increased the use of such services by consumers of various backgrounds irrespective of their education qualification.

Cloud computing possess following benefits for Indian Railways:



Though various studies have been conducted to analyse the performance of Indian railway services yet the specific analysis of impact of integration of cloud technology and digitalization in Indian Railway industry over consumer satisfaction. Present study is an attempt to fill in such research gap. The study will be useful to understand the causal relationship of using cloud technology and digitalization on the satisfaction of consumers of Railway industry of India. Besides filling in the research gap the study will also provide a ready reference for framing the consumer-oriented strategies for the industry.

2. Objectives of the research

- To analyse the cloud technology & digitalization system used by Indian Railways.

- To explore the possible impact of cloud technology & digitalization on customer satisfaction.
- To evaluate the effectiveness and future prospects of cloud technology & digitalization on customer satisfaction.

3. Literature Review

Jiby et. al., (2018) in their research titled “Growth in Indian railways sector with make in India initiative”. Explored the future prospects of Indian railways in comparison to other transport facilities operating in the world. They found a steep hike in the GDP contribution of Indian railways post “Make in India initiative”. The study also depicted increased expectation of growth of this sector of the country in the foreseeable future.

Srinivas et. al., (2018) in their paper titled “The Role of Job Crafting in Feedback-Performance Relationship: A Study of Supervisors and Managers of the Indian Railways” explored the job crafting behaviours of employees of Indian railways using “Structural Equation Modelling (SEM)”. Sample size of the study was 191 including various categories of employees working in Indian Railways. They found significant positive impact of job crafting and feedback on the performance of the respondents taken for the purposes of this study.

Mishra et.al., (2018) in their study titled “A train status assistant for Indian railways”. Analysed the status of working in Indian railways. They found alignment of work environment with HPWP’s. They also identified Furthermore; the authors identify the influence of multiple stakeholders in decision making concerning different practices. The authors additionally found that the measurement of performance goes beyond financial indicators and several context-specific non-financial indicators are identified and their social importance is reiterated.

Gondauri et.al., (2019) in their article titled “Statistical and Financial Analysis of Georgian Railways Main Performance Indicators in 2006-2019”. Statistically analysed the operating analytics of “Georgian Railway”. They found that though the Georgian-railways suffered downturn but the downturn was not swift in comparison to similar industries operating in other country and that the major reason of such comparative performance was the cloud tech and digitized services offered by this industry which kept consumers tied in.

Arshad et. al., (2019) in their paper titled “Prediction of train delay in Indian railways through machine learning techniques.” Elaborated the effectiveness of machine learning techniques to predict *delay in Train* using 3 “different machine learning methods (Multivariate regression, Neural Network, and Random Forest)”. They found that its common that trains in India get delayed by some time and hence it is important to predict such delay time in order to enhance the satisfaction of consumer.

Sharma et. al., (2020) in their research titled “Exemplar for PPP initiatives on Indian railways” evaluated the efficiency of PPP initiatives to be adopted by Indian railways. They found that both public and private nature enterprises have their own benefits and shortcomings and hence a combination of them may be used to outcome the short comings of their individual characteristics. They also found that such operating models may increase the profitability of the Indian Railways.

Bhardwaj et.al., (2021) in their study titled “Bilateral dependency and supplier performance ambiguity in supply chain contracting: Evidence from the railroad industry” evaluated the ambiguity and dependency of the supply chain in Indian Railways using cost benefit analysis. They found that “the benign approach” provides better efficiency than “the muscular approach,”. Specifically in providing enhanced consumer satisfaction in best cost-effective manner.

Roy et.al., (2021) in their paper titled “Performance Assessment Study of Indian Railways–Case of Low Efficiencies in Large Government Monopoly” attempted to study the performance assessment of liquid position of Indian railways under government monopoly. By analysing 69 division of Indian railways using data envelopment analysis (DEA) approach. They found Six basic indicators of performance such as “operating expenditures, numbers of staff employed or passengers carried, freight carried, rail network length, and revenues generated” of the success of Indian railway industry. They also identified various inefficiencies in the operating model of this industry resulting in significant financial losses.

Prasad et. al., (2021) in their study titled “Optimising Indian Railways Infrastructure”. Studied the optimisation of AI with Indian railway on the consumer satisfaction. They found that integration of AI in Railway industry has increased the utility of services provided by the railways and hence the consumers satisfaction over time.

Bhatia et.al., (2021) in their study titled “Expense based performance analysis and resource rationalization: Case of Indian Railways” analysed the rationalization of resources of Indian Railways using “Data Envelopment Analysis (DEA)-Malmquist Index” in comparison to the various other railway system operating round the world. They found that technological-innovation & staff management for achieving cost-reduction.

3. Research Methodology

This is an empirical study to analyse the impact of integration of Cloud computing and the digitalization of Indian Railways on the consumer satisfaction. For this purpose, data was collected using a structured questionnaire from a total of 150 respondents availing cloud and digitalized services of Indian Railways. Reliability of the data collected was tested using Cronbach's Alpha and KMO and Bartlett's Test and descriptive statistics of the data was tested using Mean and standard deviations. Correlation analysis and Regression analysis were utilized to evaluate the relationship between the usage of Cloud technology and the digitalization of Indian Railways and the consumer satisfaction while goodness of fit of data was analysed using ANOVA table. Predictability of consumer satisfaction was analysed by using coefficients.

4. Hypotheses of the study

H₀₁: There is no significant impact of cloud technology & digitalization on customer satisfaction.

H_{a1}: There is a significant impact of cloud technology & digitalization on customer satisfaction

5. Empirical Analysis

Testing of hypothesis in present research study has been done through various statistic methods using SPSS 22. Once the data was received, it was checked for missing values, inconsistency and negatively framed responses. The scores on negatively framed questions were suitably reversed and all the scores were fed into SPSS software (version 22).

5.1 Validation of the Data

Table: Reliability Statistics

Variables	Cronbach's Alpha	N of Items
Cloud Technology and Digitalisation	.786	12
Customer Satisfaction	.708	3

Source: Output of IBM-SPSS 22

Inferences:

The table above tests the reliability statistics of the data collected for the purposes of the study. Cornbach's alpha score above .70 is considered good. The cornbac's score of both the cloud technology and digitalization and customer satisfaction if above 0.70, which signifies the validation of the data.

Table: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.715
Bartlett's Test of Sphericity	Approx. Chi-Square	196.808
	df	80
	Sig.	.000

Source: Output of IBM-SPSS 22

Inferences:

The table above depicts the results the evaluation of data collected for the purposes of this study. The value of KMP and Bartlett's test above .50, as depicted above, statistically indicates the suitability of data for the analysis of the objective of this study.

5.2 Hypothesis Testing

H₀₁: There is no significant impact of cloud technology & digitalization on customer satisfaction.

H_{a1}: There is a significant impact of cloud technology & digitalization on customer satisfaction

Table: Descriptive Statistics

Descriptive Statistics			
	Mean	Std. Deviation	N
Cloud technology & digitalization	3.7222	.39651	150
Customer Satisfaction	4.1038	.52701	150

Source: Output of IBM-SPSS 22

Inferences:

Above table presents the analysis of descriptive statistics of the data collected for the purposes of this study. The data reveals that both the 'Cloud technology & digitalization' and 'customer satisfaction' are volatile as their standard deviation is more than the mean which signifies the scatteredness of data from the mean values of the data.

Table: Correlation Analysis

Correlations		
		Customer Satisfaction
Cloud Technology & Digitalization	Pearson Correlation	.491
	Sig. (2-tailed)	.009
	N	150

Source: Output of IBM-SPSS 22

Inference:

The above table shows the correlation Matrix between the Independent Variables of the Study. The dependent variable is 'Customer satisfaction' while the independent variable is 'Cloud technology & digitalization'.

The analysis depicts that:

- Pearson's value i.e., $r = .491$ signifies a positive relationship among the two variables.

- There exists significant relationship among 'Cloud technology & digitalization' ($p=.009$) as p value for the relationship <0.05 .

Interpretation: 'Cloud technology & digitalization' and 'customer satisfaction' are positively related and such relationship is statistically significant to influence the magnitude of customer satisfaction on the basis of use of 'Cloud technology & digitalization' in Indian railways.

Regression Analysis

Table: Model Summary

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.491	.241	.214	.28512	1.975

Source: Output of IBM-SPSS 22

Inferences:

The above table shows the model summary of regression analysis of consumer satisfaction on the basis of 'Cloud technology & digitalization'; **R Square** is **.241** which means that it shows **24.1%** of the variability with significant effect on **consumer satisfaction**.

The above table shows multiple linear regression model summary and overall fit statistics. It indicates that **R** value of our model is .491 with the **R² = .241**. Linear regression shows 24.1% of variance in the data. The Durbin-Watson $d = 1.975$, which is falls between the two critical values $1.5 < d < 2.5$. Therefore, we can presuppose that there does not exist first order linear auto-correlation in our multiple linear regression data.

Table: ANNOVA goodness of fit (GOF)

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.799	1	.799	2.912	.009
	Residual	40.585	148	.274		
	Total	41.384	149			

Source: Output of IBM-SPSS 22

Inferences:

In ANNOVA table the F-ratio tests whether the regression model is a good fit for the data. The above table shows that use of 'Cloud technology & digitalization' (independent variables) statistically significantly predictor of 'consumer satisfaction' (dependent variable). The F sig. value is .009 which is less than 0.05, thus the regression model is a good fit of the data. The F-test is highly significant; thus, we can assume that the model explains a significant amount of the variance in consumer satisfaction of the company.

Table: Coefficients

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.417	.405		8.436	.000
	Online Passenger Reservation System	.185	.108	.139	1.707	.090

Source: Output of IBM-SPSS 22

Inference:

From the above table presents the coefficients of variation in Consumer satisfaction on the basis of 'Cloud technology & digitalization'. The data reveals that 'Cloud technology & digitalization' is the significant predictor of 'consumer satisfaction' as its **sig. value** is less than **0.05** which indicates that null hypothesis is rejected.

6. Conclusion and Recommendation

A quantitative analysis of impact of 'Cloud technology & digitalization' on the satisfaction of consumers of Indian railways revealed that 'Cloud technology & digitalization' has a significant positive impact over such consumer satisfaction. The findings are also supported by the fact that use of 'Cloud technology & digitalization' increases the experience of consumers of Indian railways. It facilitates hassle free online ticket booking and reservation along with tracking of the train and booking of cabs and transportation before reaching the drop station. In addition, it also facilitates them to order desired fresh food while travelling which ensures customisable comfy travel for consumers and thereby increases their satisfaction level. Thus, the results of this study are authenticated on both quantitative and practical grounds.

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