

AN INVESTIGATION OF IT ADOPTION PROPENSITY IN CIVIL AVIATION SECTOR

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Abstract Information Technology (IT) has revolutionised the entire service industry. The aviation industry in particular has fostered a dependency on technology for strategizing their operational effectiveness. Airlines were early adopters of IT and have a long history of technological innovation, in comparison to many other travel and tourism businesses. Information technology has changed the paradigm of product development and distribution. Airlines have recognized IT, as sources of information dissemination for enhancing the effectiveness of business processes. This paper thus examined the existing status of information technology in civil aviation sector and conducted impact analysis of IT adoption on effectiveness of business processes on the basis of data obtained from 388 randomly selected respondents i.e. employees from major airlines operating in India namely Air India, Jet Airways and Kingfisher. The reliability of well designed questionnaire is examined by using the split half test and Cronbach's Alpha. The data after purification and validation through factor analysis was subjected to multivariate tools. The results of Factor analysis, hierarchical regression model and ANOVA revealed IT adoption has positive impact on effectiveness of business processes and there exists significant difference for IT adoption across various airlines under reference. The results depict that Jet Airways has higher level of information technology adoption followed by Air India and Kingfisher. The study provides fresh insights into multiple dimensions of information technology adoption construct.

Keywords Information Technology, Business Process, Civil Aviation Sector.

INTRODUCTION

Information Technology has been one of the key drivers for faster and inclusive growth and gives a competitive edge to any business organisations. Information Technology (IT) is referred to as the use of electronic machines and programs for processing, storage, transfer and presentation of information (Bjork, 1999). Perhaps, the airline industry has changed drastically during the last few decades due to deregulation and the dawn of information technologies (Buhalis, 2004). IT has provided a distribution channel linking airlines more closely to their potential customers. IT has changed the paradigm of product development, distribution and enhanced the performance of business processes (Yoon et. al., 2006). Airlines have recognized IT as sources for information dissemination and revenue generation (Smith et al., 2001; Alamdari et al., 2006). Information technology (IT) provides powerful tactical tools for organisations and has capacity in

leveraging competitive advantage (Porter, 2001). IT impacts operational efficiency and generates tremendous value for organisations (Lee, 2001). In aviation sector, IT-enabled services bring out cost reduction in providing better services to passenger handling and terminal facilitation services and also enhancing operational effectiveness by providing technical data of airports, flight plan and real time flight information in the web site (Bhatia, L. et al., 2010). These business advantages have led a dependency on information technology for their operational and strategic management. Airlines were early adopters of ITs and have a long history of technological innovation, in comparison to many other travel and tourism businesses (Buhalis, D., 2004). Airlines use latest telecommunication methods and technological solutions to find ways and means of providing superior and speedy service to air passengers. Infact, airlines perceive that the way to cut costs without compromising the quality is only through information technology enabled services. With this back drop, it can be generalized that IT enables

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organizations to become more efficient and competitive in the business processes. Further, strategic usage of information technology for enhancing organisational effectiveness in terms of reduced transaction costs, communication, collaboration, information access, decision making, quality control, data management and knowledge management has been much explored in developed economies where as IT adoption in airlines in context of developing economies like India has been under researched. Thus this understanding of information technology as a strategic tool necessitates examining IT adoption propensity of civil aviation sector.

REVIEW OF LITERATURE

The review of the past researches reveals that IT has been a useful tool for airlines that provides the valid justification for its adoption in terms of enhancing overall business process effectiveness. Granados *et al.* (2007) found that the airline industry has begun to leverage the IT adoption by empowering passengers to search for flights electronically. Information technology adoption has increased capabilities of the airlines by altering the relationships with employees and passengers (Reuer & Kearney, 1995). Further, Dehbashi and Nahavandi (2007) found that attitude, subjective norms and perceived usefulness significantly affect customers' intention to purchase e-ticket. Similarly, Seneler *et al.* (2010) revealed that usefulness and ease of use are affecting the intention to use online services. Where as in another study by Cheng *et al.* (2011) found that consumers prefer the online channel due to its lower price and ease of use. Moreover, Lee *et al.* (2012) studied the effect of technology readiness on customers' attitudes toward adoption of technology enabled service. Therefore it can be perceived that technology readiness has a positive effect on attitudes and overall intentions toward using technology enabled service. However, Kleina *et al.* (2004) discussed negative effects of the underlying market structure and the product complexity in the slow adoption of online booking. In addition to this, Long *et al.* (2009) revealed that attitude and external stimuli best explain passengers' behavioral intentions to use the technology enabled service, whereas perceived usefulness and perceived ease of use have little effect on their intentions.

The linkages between IT and customer satisfaction can be developed on the basis of various research studies. Further, Oyewolea *et al.* (2008) examined the impact of the use of information technology (IT) on passenger airline services. Airlines are of the opinion that IT alone is sufficient to ensure adequate services and customer satisfaction. However Aua and Cheng (2012) indicated that actual and expected performance of an information system are two determinants of airline employee satisfaction. Ensuring that end users are able to use advanced airline information

systems is critical for airlines to gain operational efficiency and passenger satisfaction in terms of IT usage for product distribution is concerned. Moreover, Shon *et al.* (2003) focused that in technology enabled services provided by airlines, a virtual channels are good enough to distribute the product. Moreover, Yoona *et al.* (2006) showed that IT enabled service delivery have significant impacts on air ticket distribution channels thereby increasing the effectiveness of business processes. Jong *et al.* (2003) highlighted that airline industry is actively adopting various forms of technological innovations. Guah and Joseph (2012) identified that high technology adoption is necessary for airlines seeking to gain a competitive advantage in the ever-dynamic airline industry. The reinforcement of IT enabled business activity in airlines has resulted in an increase of sales volume for airlines' websites. Nucciarellia & Gastaldia (2008) highlighted the impact of information technologies in airline and considered information technology as a key factor to generate effectiveness in the business processes.

Research Gap

A large number of research studies have been conducted dealing with impact of information Technology on the service organizations. However most of them have restricted themselves to information technology applications, related customer and employee centric attitudinal measurement (Seneler *et al.*, 2010) and its impact on the customer satisfaction, profitability (Oyewolea *et al.*, 2008; Nucciarellia & Gastaldia, 2008) & competitive advantage (Guah and Joseph, 2012) where a less consideration is paid to study the existing status of information technology adoption in Indian context in the civil aviation sector and that necessitates the need and relevance of present study. The study is descriptive, exploratory and comprehensive in nature as it validates the various dimensions of IT adoption scale. In order to bridge the gap in extant literature and to address shortcomings of current literature, present study is undertaken to evaluate the IT adoption in Indian civil aviation sector in terms of assumptions and research questions as discussed below.

HYPOTHESES FORMULATION

H1: There exists significant difference for IT adoption across various airlines under reference.

H2 : IT adoption has positive impact on effectiveness of business processes.

OBJECTIVES

The objectives of the present study are outlined as:-

1. To examine the existing status of IT in civil aviation sector.

2. To identify the underlying factors influencing IT adoption in select organisation.
3. To investigate the level of IT adoption across the airlines under study.
4. To conduct impact analysis of IT on effectiveness of business processes.

RESEARCH METHODOLOGY

Both secondary and primary sources of data collection have been used. The secondary data have been extracted from journals, airline websites and airline magazines. The primary data have been collected with the help of a specifically designed questionnaire developed on the basis of extant literature (Bharadwaj, 2000; Bhatia, L. *et al.*, 2010; Chonko *et al.* 2003; Zahra & George, 2002; Mcivor, R. *et al.*, 2003; Seneler *et al.*, 2010) through stratified sampling technique. The questionnaire has been further modified after reviewing the existing literature to add new items identified in the Indian literature to make it suitable in the context of Indian civil aviation employees. The questionnaire was finalized after conducting a pilot survey to ensure its reliability and validity. To check the reliability Cronbach's Alpha and split half value have been worked out. The test has been applied twice i.e. before and after factor analysis by dividing the respondents into two equal halves. The data were found as reliable before the Factor analysis as mean values of both groups (Group I= 3.934 and Group II = 3.833) are almost similar. Similarly, after Factor analysis, the data have proved quite satisfactory in terms of split half reliability as mean obtained from both halves of respondents are satisfactory (Group I= 3.950 and Group II= 3.77). Moreover, Cronbach's Alpha Value also proved reliable before and after factor analysis as it came to be .803 and .809 respectively (Table 1).

Table 1 Split half Reliability and Cronbach's Alpha

Group	Before Factor Analysis	After Factor Analysis
Group I	3.934	3.833
Group II	3.950	3.77
Cronbach's Alpha	.803	.809

The questionnaire comprised of 5 items of general nature, 38 items relating to information technology adoption scale. All the statements other than the statements relating to general information were based on 5 points Likert scale ranging from 5 = Strongly Agree and 1 = Strongly Disagree. For making the study more comprehensive, exhaustive and representative the respondents have been surveyed from the five airports of north India viz., Jammu airport, Chandigarh airport, Srinagar airport, Amritsar airport, New Delhi airport

working in three major airlines of civil aviation sector. In order to draw proportionate sample for each strata, a sample size of 388 employees was contacted in five selected airports i.e., 62 each from Jammu, Chandigarh, Srinagar airport, and 101 each from Amritsar and New Delhi airport.

FINDINGS AND DISCUSSIONS

The findings and discussion of the study have been summarised as under:-

The demographic factors of the employees in select airports of India have been discussed in detail on the basis of their respective percentage values (Table2). Out of the total respondents, Male respondents are 220 (57%) and female respondents are 168 (43%). The number of professional respondents 156 (40%) is the highest followed by post graduate respondents 139 (36%) and graduate respondents 93 (24%). Majority of the respondents are from passenger service 165 (42%) followed by support service 158(41%) and in-flight service 65 (17%). Majority of the respondents are from lower management 329 (85%) followed by middle management 43(11%) and top management 16 (4%). Out of the total respondents, 119 (31%) respondents are from Air India, 138 (35%) respondents are from Jet Airways, 131 (34%) respondents are from Kingfisher.

Table 2 Staff Profile of Respondents (Demographics)

Variables	N	%	Variables	N	%
Gender:			Level in the Organisation:		
Male	220	57	Lower Mgmt	329	85
Female	168	43	Middle Mgmt	43	11
Qualification:			Top Mgmt	16	4
Up to graduation	93	24	Airline:		
Post graduation	139	36	Air India	119	31
Professional	156	40	Jet Airways	138	35
Functional Area:			Kingfisher	131	34
Passenger service	165	42			
In-flight service	65	17			
Support service	158	41			

Exploratory Factor Analysis: IT Adoption in Civil Aviation Sector

Exploratory factor analysis has been done through SPSS, 17 Version with Principal component analysis along with varimax rotation for summarisation of the total data in to minimum meaningful factors. The items having factor loading less than 0.5 and Eigen values less than 1 were

ignored for the subsequent analysis (Hair et al., 1995). With the application of factor analysis the Information Technology adoption scale comprising of total 38 statements has been

reduced to 30 statements that converged to five factors with 74.413% of variance explained (Table 3).

Table 3 EFA: IT Adoption and Factors Influencing IT Adoption in Airlines

Factor	Variables	V M	SD	FL	C	FM	EV	VE	CA
IT Infrastructure	Generous budget for IT hardware and software	4.24	0.60	.985	.972	3.94	6.511	6.511	.979
	Emphasized IT staffing and training	4.13	0.43	.982	.969				
	State of the art IT capabilities	4.09	0.49	.950	.908				
	Internet applications	3.51	0.62	.942	.896				
	Technology for security	3.89	0.59	.931	.877				
	Technology for environmental sustainability	4.11	0.65	.927	.862				
	State of the art digital flight information display systems	3.63	0.93	.857	.735				
Strategic Alignment	IT capability for supporting business strategies	3.87	0.53	.942	.910	3.84	5.991	15.385	.947
	IT projects in compliance with business strategies	3.86	0.48	.935	.907				
	IT applications supported business strategies to improve process management	3.81	0.36	.925	.882				
	IT applications to improve product service offerings	3.53	0.63	.920	.873				
	IT investments that help reduce operational costs.	4.23	0.57	.742	.588				
	Technology for creating new strategic knowledge	3.79	0.42	.683	.490				
Organisational Structure	IT adoption has changed Org. structure for more timely decisions.	3.67	0.54	.951	.936	3.71	4.527	13.905	.938
	Org. structure has been adjusted for new business practices	3.43	0.63	.948	.935				
	Org. structure has been changed to enhance employee empowerment	3.83	0.40	.903	.853				
	Org. structure has been changed to increase operation mobility	3.73	0.56	.827	.697				
	Org. structure has been changed to enable inter-department integration	3.92	0.62	.751	.602				
Perceived IT Benefits	Using technology makes it convenient to do my job.	3.58	0.56	.774	.633	3.68	2.911	12.692	.852
	Using technology enhances my effectiveness on the job.	3.98	0.68	.755	.646				
	Improved quality of decisions in the organization.	3.42	0.61	.729	.585				
	Technology has made available services around the clock.	3.77	0.58	.723	.596				
	IT enables organization to accomplish task quickly.	3.70	0.64	.692	.580				
	Technology has increased possibility to compare between different product offerings.	3.43	0.49	.686	.561				
	Technology improves the quality of work I do.	3.89	0.69	.583	.403				

Factor	Variables	V M	SD	FL	C	FM	EV	VE	CA
Individual Learning	Employee learning new IT applications quickly.	3.75	0.52	.847	.773	3.49	2.384	11.543	.877
	Sufficient training for new IT systems and applications.	3.13	0.48	.829	.706				
	Employee able to adopt new IT applications for their work.	3.74	0.46	.804	.688				
	Little resistance to adopt new IT systems and applications	3.63	0.52	.753	.590				
	Innovating new ideas and approaches to work effectively by adopting new IT applications	3.21	0.47	.749	.671				
Grand		3.73(Mean)						74.413(VE)	

VM = Variable Mean, SD= Standard Deviation, FL= Factor Loadings, C=Commonalities, FM=Factorial Mean, EV= Eigen Values and VE=Variance Explained, CA= Cronbach Alpha

Table 4 ANOVA: Differences in IT Adoption Among Select Airlines

Airlines	Source of variations	Mean	Sum of Squares	df	Mean Square	F	Sig.
Air India	Between Groups	3.92	7.580	2	3.790	43.187	.000
Jet Airways	Within Groups	3.97	33.789	385	.088		
Kingfisher	Total	3.66	41.369	387			

Information Technology Adoption

The overall mean score of this dimension is 3.73 indicating high level of Information technology adoption in airlines under study. The total variance explained for Information technology adoption was 74.413%. This dimension came up with five factors viz., Information Technology Infrastructure, Strategic Alignment, Organisation Structure, Perceived Information Technology benefits, Individual Learning. These factors are discussed in detail as below:-

Information Technology Infrastructure (F1): The first factor having Mean = 3.94 with Eigen value 6.511 comprised of seven items (Table 3). The mean values of the items under this factor range from 4.24 to 3.51. About 85% of the total respondents agreed that airline has allocated a generous budget for purchasing information technology hardware and software (4.24).

Strategic Alignment (F2): The second factor having Mean = 3.84 with Eigen value 5.991 comprised of six items. The item 'our information technology capability has supported business strategies that strengthen customer service' has the highest factor loading (.942) indicating high association with this factor.

Organisational Structure (F3): The third factor having Mean = 3.71 with Eigen value 4.527 comprised of five items. The mean values of the items under this factor range from 3.43 to 3.92. About 73% of the total respondents agreed that organizational structure, by adopting new information technology systems and applications has been changed to increase operation mobility (3.73).

Perceived IT Benefits (F4): The fourth factor having Mean = 3.68 with Eigen value 2.911 comprised of seven items. The item 'Using technology makes it convenient to do my job' has the highest factor loading (.774) indicating high association with this factor. The item 'Using technology improves the quality of work I do' having the least factor loading (.583) and therefore stands least associated with this factor.

Individual Learning (F5): The fifth factor having Mean = 3.49 with Eigen value 2.384 comprised of five items. The mean values of the items under this factor range from 3.13 to 3.75. About 67% of the total respondents agreed that company has provided sufficient training while implementing new information technology systems and applications (3.13). (Table 3)

Testing of Hypotheses

H1: There exists significant difference for IT adoption across various airlines under *reference*.

To test first hypothesis, respondents have been classified into three categories, on the basis of airline, viz., Air India (31%), Kingfisher (34%), Jet Airways (35%). To find out the mean difference among different airline groups regarding information technology adoption, Univariate Analysis of Variance has been applied. On the whole, ANOVA reveals significant mean difference of information technology adoption among the respondents belonging to different airline groups ($F=43.187$, Sig. =.000, Table 4). Therefore, the results support the hypothesis "There exists significant

Table 5 Regression Analysis: Impact Analysis of IT Factors on Business Effectiveness

Model	R	R ²	Adjusted R ²	Std. Error of Estimate	F value ANOVA	Sig. level	β	t	Sig. level
1	.530	.280	.279	.40529	100.827	.000	.174	8.007	.000
2	.534	.285	.281	.38539	76.689	.000	.257	6.168	.000
3	.563	.316	.311	.37727	59.268	.000	.159	3.648	.000
4	.584	.341	.335	.37079	49.656	.000	.358	4.208	.000
5	.601	.361	.353	.36568	43.202	.000	.151	3.434	.001

a. Predictors: (Constant), Perceived IT Benefits

b. Predictors: (Constant), Perceived IT Benefits, Strategic alignment

c. Predictors: (Constant), Perceived IT Benefits, Strategic alignment, Organisational structure

d. Predictors: (Constant), Perceived IT Benefits, Strategic alignment

Organisational structure, Information technology infrastructure

e. Predictors: (Constant), Perceived IT Benefits, Strategic alignment

Organisational structure, Information technology infrastructure

Individual learning

f. Dependent Variable: Overall business process effectiveness

difference for IT adoption across various airlines under reference.”

H2 : IT adoption has positive impact on effectiveness of business processes.

To test second hypothesis, step-wise regression analysis has been applied. Table 5 shows the strength of relationship between overall effectiveness of business processes and independent factors of IT adoption.

The regression model equation is as following:

$$OEBP = \alpha + \beta_1 F1 + \beta_2 F2 + \beta_3 F3 + \beta_4 F4 + \beta_5 F5$$

$$OEBP = .833 + .174 ITI + .257 SA + .159 OS + .358 PITB + .151 IL$$

Where α = constant, $\beta_1 \beta_2 \beta_3 \beta_4 \beta_5$ represents coefficient of regression for the different independent factors, OEBP= Overall effectiveness of business processes, ITI= Information Technology Infrastructure, SA= Strategic Alignment, OS= Organisation Structure, PITB =Perceived Information Technology benefits and IL =Individual Learning. When ITI is increased by one unit, OEBP increases by .174. Similarly, when SA, OS, PITB, IL increases by one unit, OEBP increases by .257, .159, .358, .151 respectively. The result of step-wise regression analysis enticed five independent factors as significant in predicting the dependent variable. These were: “Perceived IT Benefits”, “Strategic alignment”, “Organisational structure” and “Information technology infrastructure”, “Individual learning”. The correlation between predictor and outcome is positive with values of R as .530, .534, .563, and .584, .601 which signifies high correlation between predictor and the outcome. In model

1, R is .530 which indicates 53% association between dependent and independent variable. R-Square for this model is .280 which means that 28% of variation in business process effectiveness can be explained from the independent variable. Adjusted R square (.279) indicates that if anytime another independent variable is added to model, the R-square will increase. Further beta values reveal significant relationship of independent variables with dependent variable. “Perceived IT Benefits” has emerged as the strongest predictor whereas “Individual Learning” is found to be the weakest as represented by relative t-values. Change in R square is also found to be significant with F-values significant at 5% confidence level. Therefore, the aforesaid findings support the hypothesis “IT adoption has positive impact on effectiveness of business processes.”

CONCLUSION AND FUTURE RESEARCH

Aviation industry in India has undergone a rapid transformation with the liberalization of the Indian civil aviation sector. Technological adoption has intensely altered the relationships between airline and customers and enabled the airlines to stay ahead in highly competitive markets. New technologies have been adopted in Indian civil aviation industry during the last few decades and the trend is likely to continue into the future. The results of factor analysis, hierarchical regression model and ANOVA reveal that IT adoption has positive and significant impact on effectiveness of business processes and there exists significant difference for IT adoption across various airlines under reference. The results depict that Jet Airways has higher level of information

technology adoption followed by Air India and Kingfisher. The study provides fresh insights into multiple dimensions of information technology adoption construct. Further, on the basis of various suggestions given by respondents, It is pointed out management of airline must conduct behavioral analysis of their employee for IT in terms of complexity, strategic alignment, individual learning, ease, convenience so that necessary training program can be designed for developing employee favourable attitude which can further enhance the business process effectiveness. It is suggested that different department of the airline must work in cohesive and close collaborative mode so that IT can be used in a systematic manner for enhancing functional, operational and departmental effectiveness. However, It is worth while recognizing that above discussions are confined to sample size of 388. It is evident from values of R and R² that the impact of predictors viz., Perceived IT Benefits, Strategic alignment, Organisational structure, Information technology infrastructure Individual learning on overall business process effectiveness is moderate and which can be enhanced by adding more dimensions in upcoming research. Lastly, the identified limitations generate the scope for further study. It is evident from values of R and R² that the impact of predictors viz., Perceived IT Benefits, Strategic alignment, Organisational structure, Information technology infrastructure Individual learning on overall business process effectiveness (dependent) is moderate and which can be enhanced by adding more dimensions in upcoming research. A separate study to be conducted for examining employee's attitude towards IT and its effects on organisational effectiveness. Additionally, customer perspectives as important stakeholders for any business success relationships is also required to be examined as being important stakeholders for business to customer relationships. Lastly scope can also be extended to the various other airlines operating in the similar environment.

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