DEVELOPMENT OF BALANCED SCORE CARD FRAMEWORK FOR PERFORMANCE EVALUATION OF AIRLINES

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ABSTRACT

The paper aims to design a multidimensional performance measurement system for airlines in order to address the complexity of balancing objectives and operational activities. The research design and methodology uses secondary data collection i.e. annual reports and business reports of airlines which are collected from the airlines own website. The paper develops and applies a customized version of balanced scorecard based on a new set of performance measures. Data on eleven performance enablers for a case study of 100 world major airlines during 2009 to 2013 is considered in the study to develop performance measurement framework of Airlines based on balanced scorecard. The Measurement of Research Construct Adopted from Wu and Laio (2014) is validated through confirmatory factor analysis using Lisrel 8.8 and developed modified set of indicators of the constructs. Further, CRITIC method is used to determine relative weights of the indicators under respective perspectives of balanced scorecard.

Keywords: Balance score card, Confirmatory analysis, critic method.

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1. INTRODUCTION

In any business environment the measurement of performance of productive system of goods or services is basic management instrument for taking of decisions and for the establishment of new actions, also serving as an aid for new strategically plans for business improvement. An efficient and accurate performance evaluation system is essential as a useful tool for the managers to control, monitor and improve the performance of the organization. Effective performance evaluation systems have the following features: Comprehensiveness,

Comparability, Measurability and compatibility with goals. Among the advantages of performance evaluation are identification of opportunities for improvement and justification of the decisions for stakeholders.

The global airline industry provides a service to virtually every country in the world, and has played an integral role in the creation of a global economy. The airline industry itself is a major economic force, in terms of both its own operations and its impacts on related industries. Currently, airlines have suffered from high levels of competition and economic pressure, with high volatility in fuel and foreign exchange rates, shrinking fuelled by consolidation and bankruptcies, mergers, capacity cuts, bankruptcy filings, large scale losses and high debt levels. Over the last few decades, the problem of performance evaluation has attracted significant attention which led to variety of methods that seek to develop measures to assess the performance of organizations in general and airline industry in specific to deal with the performance measurement technique.

The balanced scorecard approach is makes explicit links between different performance dimensions for the evaluation of a complex system, such as airline organizations. Major issue with the BSC is the tendency towards financial measures that managers may pay insufficient attention to leading and non-financial measures causes the failure of the purpose of the Balanced Scorecard. The Balanced Scorecard has been successfully implemented across a wide number of industries and geographical locations. Organizations must foster involvement, consistency and adaptability in order to achieve measurable results from the implementation of a BSC (Deem, et al., 2010).

2. LITERATURE SURVEY

Gusnardi et al., (2017) aimed to analyze the dimensions of balanced scorecard as a representation of strategic planning and management system as a new style of government areas through CFA. The population and the sample used are of local government officials serving the financial statements of local government in North Sumatra as many as 361 respondents with purposive sampling methods.

Najafi, et al., (2009) identified the four perspectives including financial, customer, internal processes, and learning and growth perspectives and tries to make a balance between financial goals and the other remained perspectives.

The BSC particularly identifies the cause-and-effect relationship among leading indicators and lagging indicators (Eilat et. al., 2008).

The balanced scorecard facilitates decision making using a variety of accounting measures from different entity perspectives; traditionally, these perspectives are labeled financial, customer, internal business process, and learning and growth (Hank et al., 2015).

Balanced Scorecard measures are specifically selected to assess whether strategic objectives are being achieved (Cheng & Humphreys, 2012; Humphreys & Trotman, 2011; Kaplan, Petersen, & Samuels, 2012; Libby, Malina et al., 2007).

Hasan Dinçer et al., (2017) evaluated the performance of the European airlines, using a balanced scorecard perspective and recommend European airlines to focus on these aspects in order to improve their performance.

Anirut Pipatprapa et al., (2016) combined structural equation modeling (SEM) and fuzzy analytic hierarchy process (FAHP) to identify the priority weight of factors for assessing the Environmental Performance (EP) of Taiwan's food industry. A SEM approach was used to develop and define EP factors and sub-factors using a questionnaire designed to gather data from 163 managers in the food industry. A FAHP approach was employed to prioritize the scores using a questionnaire to interview 21 experts regarding the different aspects of EP.

Bojuwon Mustapha and Bojuwon Yusuf Bolaji (2015) measured lecturers' commitment scale using second order confirmatory factor analysis on the hypothesized model with four latent variables of commitment to student, commitment to teaching, commitment to school and commitment to the profession.

Shahid Hussain et al., (2018) applied SEM approach to identify the critical factors affecting quality in social infrastructure projects. The authors developed a quantitative approach using smart-PLS version 3.2.7.

David Staš et al., (2015) designed a conceptual framework for creating the Green Transport (GT) Balanced Scorecard (BSC) models from the viewpoint of industrial companies and supply chains using Analytic network Process (ANP).

Agnieszka Tubis and Sylwia Werbińska-Wojciechowska (2017) presented elements of the BSC corresponding to the general trends of changes and strategies currently being undertaken by the companies in the road passenger transport sector.

Frederico, Guilherme F and Cavenaghi, Vagner (2008), presented a performance management model, based in the Balanced Scorecard, through a case study of Brazilian freights railroad transportation and approaches four Balanced Scorecard's perspectives (financial, customers, processes and learning and growth).

Hamed Rahimi et al., (2017) analyzed systematic relations between key indicators of hospital performance evaluation, identifying causal relations and prioritizing indicators based on the 4 perspectives described by the balanced scorecard (BSC).

Saif Hassan Ali Alzaabi and Hassan Al-Dhaafri (2018) investigated the effects of Strategy Management (ST) and Balanced Scorecard (BSC) on Organizational Performance (OP). Based on a theoretical foundation and a wide review of the literature, the model of the research was proposed 220 Questionnaires were distributed among random selected sample of Civil Defense departments in the Northern Emirates using structured equation modeling

Vinh V. Thai (2015), investigated the concept of Port Service Quality (PSQ) and examines its influence on customer satisfaction in the port sector. Following a literature review, a conceptual model of PSQ and its influence on customer satisfaction is proposed. Confirmatory factor analysis, followed by multiple regression is conducted to confirm the PSQ construct and examine the relationship between PSQ and customer satisfaction.

3. CONFIRMATORY FACTOR ANALYSIS OF BALANCED SCORECARD

Wu and Laio (2014) proposed balanced scorecard indicators in respect of airline organizations and are presented in Table-1.

Table 1: Balanced scorecard constructs (Wu and Laio, 2014)

Construct	Indicator
Financial Perspective	Operating Revenue (OR) Return On Investment (ROI) Return On Assets (ROA) Net Income (NI)
Customer Perspective	Revenue Passenger Kilometer (RPK) Number of Passengers (NP) Revenue Ton Kilometer (RTK)
Internal Business Perspective	Energy (Fuel) Cost (EC) Capital Cost (CC)
Learning and Growth Perspective	Labor Cost (LC) Operating Expenses per employee (OE)

4. METHODOLOGY

To conduct CFA, initially items are generated that accurately reflect the proposed constructs of the subject under consideration based on a comprehensive literature review and comments from an expert panel. A questionnaire is developed for each of the construct with measurement items. Respondents (stake holders) are asked to measure their level of agreement for each of the construct items on a Likert scale (i.e. strongly disagree to agree strongly). Then CFA is implemented to assess how well the observed variables reflect the proposed constructs using some statistical softwares like AMOS, Lisrel etc. In this study, instead of primary data collection from questionnaire, secondary data collection from annual reports, financial statements etc. is made to conduct CFA.

Integrated methodology for development of framework of balanced scorecard for evaluation of is explained below. In this study, data on 11 parameters of 100 airlines are considered to develop the framework. The flow diagram of the methodology is presented in Fig.1.

Figure 1: Flow diagram of the proposed methodology

The stepwise methodology is discussed below.

Step-1: Consider hypothesized Model of balanced scorecard

Hypothesized measurement model of balanced scorecard performance of Airlines namely: (i) financial perspective (FP) (ii) Customer Perspective (CP) (iii) Internal Business perspective (IBP) and (iv) Learning and Growth perspective (LGP) is considered and is shown in Fig.2.

Figure 2 Hypothesized model of balanced scorecard of airlines

Step-2: Collect the data

Obtain the data on 11 items of the balanced scorecard perspectives from secondary sources of data (annual reports, financial statements).

Step-3: Formulate Correlation matrix

The proposed approach utilizes correlations among the items of the perspectives of Airlines.

Step-4: Perform Confirmatory Factor Analysis

Confirmatory factor analysis was adopted to validate the hypothesized measurement model of balanced scorecard performance of Airlines using correlation matrix.

Step-5: Determine Goodness of fit:

Goodness of fit indices are determined from the confirmatory factor analysis. The fit model is an indication of relation between the observed variables (criteria) and their latent variable.

Step-6: Determine relative weights of the observed variables

In this study, CRITIC method is proposed to determine relative weights of the observed variables (items)

Step-6.1: Obtain Data on the validated criteria

Obtain the data on the criteria of the balanced scorecard perspectives as validated in the CFA.

Step-6.2: Normalize the data

Normalize the data using the relations as discussed in section 4.1

Step-6.3: Determine Standard deviation

Standard deviations of the criteria are determined as discussed in section 4.2

Step-6.4: Determine measure of conflict

Measures of conflict of the criteria are determined as discussed in section 4.3

Step-6.5: Determine Information content

Information content of the all the criteria are determined as discussed in section 4.4

Step-6.6: Determine relative weight

Relative weights of the criteria are determined as discussed in section 4.4

5. CASE STUDY

The study is developed based on an empirical study of selected 20 Airlines. The secondary data on 11 criteria during 2009-2013 in the study is obtained from annual reports of respective Airline companies. A comprehensive research methodology developed and shown in Fig.1 is implemented. CFA technique is used to test the hypothesis that a relationship exists between the observed variables (Criteria) and their underlying latent constructs. A software tool Lisrel 8.8 has been used for CFA analysis. Relative weights of the validated criteria are obtained by implementing CRITIC method.

5.1. Data on 11 items of 20 Airlines

Data on 11 criteria is collected from financial reports is presented in Table-2.

Table-2: Financial and traffic data of the airlines

S.No	Airlines	Year	OR (million \$)	ROI (%)	ROA (%)	NI (million \$)	RPK (million \$)	NP (millions / year)	RTK (million \$)	EC (million \$)	CC (million \$)	LC (million \$)	OE (million \$)
1	Aer Lingus	2009	866.035	3.55	4.99	32.039	5400	6.6	132.098	148.942	200.611	125.113	297.013
2	Aer Lingus	2010	1610.262	5.21	2.73	65.174	13895	9.346	216.628	352.632	202.916	342.945	137.079
3	Aer Lingus	2011	1655.283	7.56	3.6	9.148	14051	9.513	240.533	370.975	126.692	334.77	136.704
4	Aer Lingus	2012	1790.193	3.21	1.91	43.814	14523	9.653	239.415	460.699	184.908	342.754	139.212
5	Aer Lingus	2013	1892.45	3.12	1.96	45.283	14807	9.625	259.498	474.474	205.277	368.371	142.976
6	Aeroflot	2009	3345.9	3.21	2.15	85.8	29900	8.756	1118.5	725.4	53.1	538.9	233.5
7	Aeroflot	2010	4319.3	7.38	5.6	253.2	39200	11.286	1312.2	943	159.5	686.5	330.9
8	Aeroflot	2011	5377.9	10.42	9.21	491.3	46077.4	14.174	1708.4	1472.2	244.2	870.1	417.7
9	Aeroflot	2012	8138.1	2.38	2.66	166.3	74617.2	27.5	2682.3	2287.5	166.7	1241.8	614.1
10	Aeroflot	2013	9133.754	2.51	3.51	230.262	85300	31.4	2959.721	2484.003	276.691	1423.606	2018.237
11	Air Asia	2009	892.194	14.33	4.44	144.171	16890	14.253	254.892	264.211	517.405	87.141	111.837
12	Air Asia	2010	1225.919	38.89	8.02	329.586	18499	16.055	32.227	375.758	186.277	112.03	141.226
13	Air Asia	2011	1469.657	28.85	8.36	380.247	21037	17.987	28.346	575.395	404.158	158.303	151.778
14	Air Asia	2012	1601.912	25.21	6.13	332.625	22731	19.679	36.403	630.902	318.199	187.946	146.169
15	Air Asia	2013	1622.94	7.51	2.03	114.97	26607	21.853	44.011	702.346	421	193.955	169.007
16	Air China	2009	7523.592	9.73	4.45	703.132	75473.77	41.279	629.895	2117.727	1543.873	970.205	1962.544
17	Air China	2010	12184.345	17.12	7.77	1822.147	105695	60.006	924.58	3559.264	1678.155	1455.243	3033.595
18	Air China	2011	15220.64	7.72	4.02	1092.357	123489.07	69.687	1165.753	5367.444	2065.935	1897.766	3644.6

Development of Balanced Score Card Framework for Performance Evaluation of Airlines

S.No	Airlines	Year	OR (million \$)	ROI (%)	ROA (%)	NI (million \$)	RPK (million \$)	NP (millions / year)	RTK (million \$)	EC (million \$)	CC (million \$)	LC (million \$)	OE (million \$)
19	Air China	2012	15979.43	5.14	2.63	780.925	129773.32	72.416	1109.149	5647.52	2833.978	2162.786	3445.072
20	Air China	2013	15958.409	3.82	1.76	587.58	141967.95	77.677	1114.483	5481.255	2659.265	2279.417	3836.409
21	Air Newzealand	2009	2995.85	0.33	0.42	13.65	27112	12.4	616.85	109.655	1383.2	662.35	361.4
22	Air Newzealand	2010	2797.809	1.66	1.78	56.703	25829	12.3	614.052	649.319	1144.433	674.904	341.601
23	Air Newzealand	2011	3576.984	1.53	1.65	66.744	26996	13.103	745.72	893.216	1452.712	852.016	418.592
24	Air Newzealand	2012	3530.363	1.53	1.3	55.913	27013	13.122	746.55	959.963	1370.25	826.875	397.688
25	Air Newzealand	2013	3602.184	3.07	3.25	141.966	27733	13.411	771.451	939.158	1641.186	833.853	433.697
26	Allegiant Air	2009	557.94	15.85	15.28	76.331	4762.41	5.328	52.938	165	77.486	90.006	96.179
27	Allegiant Air	2010	663.641	9.9	13.11	65.702	5466.237	5.903	60.579	243.671	141.342	108	110.049
28	Allegiant Air	2011	779.117	6.34	6.99	49.398	5640.577	6.176	81.228	330.657	128.52	119.856	118.856
29	Allegiant Air	2012	908.719	9.44	9.82	78.414	6514.056	6.987	73.897	378.195	111.393	133.295	133.525
30	Allegiant Air	2013	996.15	10.15	9.87	91.779	7129.416	7.241	72.818	385.558	141.449	158.627	145.919
31	Cathay Pacific	2009	8587	5.78	6.03	623	89440	24.558	3834	2224	1309	1618	1791
32	Cathay Pacific	2010	11477	13.62	15.55	1825	96588	26.796	4363	3625	1516	1776	2124
33	Cathay Pacific	2011	12616	4.87	5.66	727	101536	27.581	4380	4984	1404	1894	2255
34	Cathay Pacific	2012	12741	0.93	0.95	145	103837	28.961	4542	5188	1488	2061	2375
35	Cathay Pacific	2013	12882	2.33	2.51	372	104571	29.92	4871	4889	1687	2183	2361
36	Cebu Pacific Air	2009	489.885	14.32	9.22	68.464	7056	8.756	68.651	154.677	95.085	27.096	132.561
37	Cebu Pacific Air	2010	645.176	28.12	13.86	153.538	8860	10.461	76.151	217.533	68.139	43.513	140.904
38	Cebu Pacific Air	2011	784.013	10.88	7.26	83.735	10531	11.933	91.474	351.646	93.791	56.845	175.631
39	Cebu Pacific Air	2012	898.146	49.56	6.41	84.639	11533	13.255	104.236	416.128	100.484	72.084	204.818
40	Cebu Pacific Air	2013	966.117	1.16	0.76	12.062	12927	14.352	114.46	459.984	190.554	64.305	209.639
41	China Eastern Airlines	2009	5707.805	0.44	0.27	28.789	60942.09	44.043	1359.704	1794.041	1574.05	753.758	1131.339
42	China Eastern Airlines	2010	10901.637	7.43	5.11	780.554	93152.76	64.93	2344.649	3191.394	1986.535	1320.655	1657.045
43	China Eastern Airlines	2011	12744.992	5.78	3.99	707.826	100895.06	68.725	2363.614	4520.745	2065.632	1340.161	1957.676
44	China Eastern Airlines	2012	13509.825	3.32	2.27	444.912	109112.68	73.077	2447.805	4733.644	2499.701	1594.025	2121.418

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45	China Eastern Airlines	2013	14343.435	2.36	1.49	340.198	120461.13	79.094	1882.388	4986.922	2396.668	2186.827	2996.282
46	Copa Holdings	2009	1256.076	24.71	11.53	249.087	4597.265	7.182	180.87	300.816	168.703	157.879	199.555
47	Copa Holdings	2010	1414.806	20.54	9.43	241.057	5230.578	7.998	195.947	354.427	228.535	178.845	215.995
48	Copa Holdings	2011	1830.921	20.42	20.42	310.425	6338.098	8.723	231.694	547.221	285.059	213.094	243.428
49	Copa Holdings	2012	2249.388	17.3	16.98	326.476	7768.179	10.214	309.303	725.763	306.689	247.405	297.704
50	Copa Holdings	2013	2608.332	19.83	19.6	427.471	9032.318	11.345	343.597	783.092	413.983	276.156	338.385
51	Easy Jet PLC	2009	4159.278	2.63	1.94	111.047	5C566	45.164	252.04	1258.95	110.735	547.438	2053.437
52	Easy Jet PLC	2010	4591.724	4.09	3.03	187.339	56128	48.754	273.054	11326.798	292.205	583.792	2303.044
53	Easy Jet PLC	2011	5535.342	6.9	5.04	360.791	61347	54.509	287.03	1470.426	389.655	710.358	2374.809
54	Easy Jet PLC	2012	6106.711	6.97	5.94	404.051	65227	58.4	321.656	1820.605	437.325	777.996	2438.564
55	Easy Jet PLC	2013	6657.806	10.09	9.02	622.313	67573	60.758	331.483	1848.174	489.407	841.216	2656.555
56	Emirates Group	2009	11779.863	1.64	1.91	267.277	101762	22.731	6036.411	3932.339	2551.677	1595.751	2142.734
57	Emirates Group	2010	11831.115	6.04	5.93	970.612	126273	27.454	6276.984	3242.088	2611.53	1727.498	2215.935
58	Emirates Group	2011	14764.774	7.53	7.62	1481.895	146134	31.422	7325.349	4579.364	3094.474	2073.238	2611.762
59	Emirates Group	2012	16957.971	2.04	2.16	493.599	160446	33.981	8785.681	6613.628	3704.307	2160.619	2889.446
60	Emirates Group	2013	21109.651	2.59	2.36	655.593	188618	39.391	9869.284	7583.694	4108.889	245.82	3475.077
61	Ethiopian	2009	1107.521	10.44	12.04	122.006	9389	2.81	277.666	512.475	187.059	65.765	126.092
62	Ethiopian	2010	1267.027	9.17	10.21	122.498	10705	3.15	310.856	549.793	182.006	71.697	221.894
63	Ethiopian	2011	1493.349	4.33	3.93	74.315	13151	3.73	332.655	764.666	267.765	76.944	272.704
64	Ethiopian	2012	1873.053	2	2.01	40.666	16175	4.64	361.273	1056.087	230.231	86.839	298.353
65	Ethiopian	2013	2098.64	5.84	3.86	111.969	21358	5.918	164.469	907.532	332.298	228.463	283.446
66	Garuda Indonesia	2009	1714.944	6	6.88	97.807	18000	11.1	264.091	478.526	413.353	159.468	314.397
67	Garuda Indonesia	2010	2149.925	2.68	3.771	56.738	18465.8	12.7	356.805	696.16	490.667	192.23	383.598
68	Garuda Indonesia	2011	3096.328	2.12	3.96	64,226	24434.7	17.074	554.507	1137.745	576.795	238.607	524.448
69	Garuda Indonesia	2012	3472.469	3.39	4.33	110.843	27342.1	20.415	597.522	1255.127	654.428	144.598	618.907
70	Garuda Indonesia	2013	3759.45	0.32	0.45	13.583	31950	24.965	617.876	1420.139	843.818	699.821	706.183
71	JetBlue Airways	2009	3292	1.89	0.93	61	16131.137	22.45	149	945	578	776	783
72	JetBlue Airways	2010	3779	2.63	1.47	97	17575.513	24,254	172	1115	582	891	922
73	JetBlue Airways	2011	4504	1.95	1.22	86	19078.931	26.37	227	1664	604	947	976
74	JetBlue Airways	2012	4982	2.64	1.81	128	20859.54	28.956	338	1806	636	1044	1030
75	JetBlue Airways	2013	5441	3.19	2.29	168	22272.219	30.463	432	1899	678	1135	1129
76	Norwegian	2009	1161.242	3.73	4.85	38.669	10602	10.8	219.642	226.136	307.513	209.219	75.433
77	Norwegian	2010	1422.36	1.88	2.3	25.148	13774	13	258.193	346.22	381.586	255.363	94.898

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78	Norwegian	2011	1878.824	1.19	1.36	21.786	17421	15.7	302.158	551.858	534,875	330.042	114,276
79	Norwegian	2012	2209.266	3.94	3.83	78.455	20353	17.7	321.262	642.645	537.416	357.708	130.21
80	Norwegian	2013	2649.832	2.11	2.06	54.255	26881	20.7	385.61	800.597	797.935	424.002	158.024
81	Singapore Airlines	2009	8973.514	8.8	4.63	788.599	16604.88	18.293	915.815	4406.749	1904.658	127.009	1607.111
82	Singapore Airlines	2010	7441.988	2.61	1.24	205.031	82882.5	16.48	981.433	3076.926	1908.289	112.528	1779.475
83	Singapore Airlines	2011	9338.751	9.69	4.68	913.899	84801.3	16.647	1048.741	3639.767	2518.633	106.362	2118.723
84	Singapore Airlines	2012	9647.382	3.15	1.8	317.154	87824	17.155	1131.86	4638.538	1976.138	112.539	2213.444
85	Singapore Airlines	2013	12067.68	3.46	1.97	352.962	93765.6	18.21	1255.348	4715.269	1976.138	118.453	2141.269
86	Southwest Airlines Co	2009	10350	0.97	0.69	99	46275.146	86.31	719	3044	965	3468	2055
87	Southwest Airlines Co	2010	12104	3.94	2.97	459	48506.505	88.191	751	3620	1345	3704	2225
88	Southwest Airlines Co	2011	15658	1.15	0.99	178	60647.937	103.974	955	5644	1672	4371	2838
89	Southwest Airlines Co	2012	17088	2.53	2.26	421	63937.215	109.347	1132	6120	1584	4749	3082
90	Southwest Airlines Co	2013	17699	4.45	3.9	754	64852.838	108.076	1080	5763	1838	5035	3229
91	Turkish Airlines	2009	4557.787	6.39	0.07	362.165	40130	25.1	2215.188	987.259	865.272	913.47	691.376
92	Turkish Airlines	2010	5588.998	2.77	2.69	190.072	47950	29.119	2489.34	1434.938	916.438	1170.566	860.47
93	Turkish Airlines	2011	7031.518	0.13	0.12	11.022	58933	32.649	2895.822	2381.139	1154.099	1331.431	1082.116
94	Turkish Airlines	2012	8198.595	6.64	6.15	641.865	74410	39.045	2657.441	2867.251	1017.549	1371.7	17467.909
95	Turkish Airlines	2013	9855.085	2.65	2.69	358.322	91997	48.268	4074.998	3451.314	1605.453	1614,897	2799.297
96	WestJet	2009	1998.47	2.99	2.81	86.013	22260.131	14.039	182.513	499.871	313.321	409.918	1474.315
97	WestJet	2010	2531.953	2.44	2.53	87.525	25121.513	15.174	217.986	654.62	374.526	514.572	1823.575
98	WestJet	2011	3104.689	3.51	4,28	150,307	27177.524	16.041	288.822	925.762	453.008	582.469	2036.999
99	WestJet	2012	3427.419	5.24	6.47	242.393	29384.451	17.423	310.818	992.79	492.142	663.758	2163.678
100	WestJet	2013	3555.241	5.45	6.49	260.874	31522.197	18.691	335.996	1009.091	492.459	700.278	2250.874

5.2. Financial Perspective

The mean and standard deviation values of items under financial perspective are presented in Table-3.

Table-3: Data on criteria of financial perspective

S. No.	Items	Min	Max	Average	Std. Dev
1	Operating Revenue (OR)	489.885	21109.651	5879.351	5151.907
2	Return On Investment (ROI)	0.13	49.56	7.2129	8.185063
3	Return On Assets (ROA)	0.07	20.42	4.88641	4.239464
4	Net Income (NI)	9.148	1825	303.6458	353.0988

5.3. Customer Perspective

The mean and standard deviation values of items under customer perspective are presented in Table-4.

Table-4: Data on criteria of customer perspective

S.No.	Items	Min	Max	Average	Std. Dev
1	Revenue Passenger Kilometer (RPK)	4597.265	188618	47475.15	41995.35
2	Number of Passengers (NP)	2.81	109.347	27.94311	24.80713
3	Revenue Ton Kilometer (RTK)	28.346	9869.284	1261.903	1884.075

5.4. Internal Business Perspective

The mean and standard deviation values of items under internal business perspective are presented in Table-5.

Table-5: Internal business perspective

S.No.	Items	Min	Max	Average	Std. Dev
1	Energy (Fuel) Cost (EC)	109.655	11326.798	2062.671	2089.693
2	Capital Cost (CC)	53.1	4108.889	948.9649	898.2091

5.5. Learning and Growth Perspective

The mean and standard deviation values of items under learning and growth perspective are presented in Table-6.

Table-6: Data on criteria of learning and growth perspective

S.No.	Items	Min	Max	Average	Std. Dev
1	Labor Cost (LC)	27.096	5035	890.7852	1014.711
2	Operating Expenses per employee (OE)	75.433	17467.909	1368.594	1960.341

6. RESULTS AND DISCUSSION

To test the relationship between observed criteria and their constructs of balanced scorecard of Airlines, confirmatory factor analysis is adopted for the proposed conceptual model.

6.1. Confirmatory Factor Analysis Model-I

The proposed model is based on four main constructs of balanced scorecard namely: (i) Financial Perspective (FP) (ii) Customer Perspective (CP) (iii) Internal Business perspective (IBP) and learning and Growth Perspective (LGP)

Based on the literature review, this research suggests the following hypotheses. The detailed discussion of hypotheses development follows.

H1: Operating Revenue, Return on Investment, Return on Assets and Net Income are the measurement items of financial perspective.

H2: Revenue Passenger Kilometer, Number of Passengers and Revenue Ton Kilometer are the measurement items of Customer perspective.

H3: Energy Cost and Capital Cost are the measurement items of Internal Business Process perspective.

H4: Labour Coat and Operating Expenses per employee are the measurement items of Learning and Growth perspective

6.1.1. Correlation Analysis

In this study, correlation between the eleven items four perspectives is determined using Lisrel 8.8 to input the same for confirmatory factor analysis. The Correlation matrix so obtained is presented in Table-7.

Table-7: Correlation matrix

Items of the Perspectives	OR	ROI	ROA	N1	RPK	NP	RTK	EC	CC	LC	OE
OR	1										
ROI	-0.29	1									
ROA	-0.28	0.64	1								
N1	0.63	0.16	0.24	1							
RPK	0.91	-0.25	-0.26	0.65	1						
NP	0.76	-0.22	-0.29	0.41	0.57	1					
RTK	0.69	-0.22	-0.14	0.47	0.79	0.2	1				
EC	0.86	-0.26	-0.27	0.51	0.8	0.67	0.57	1			
cc	0.86	-0.28	-0.31	0.57	0.87	0.51	0.72	0.74	1		
LC	0.77	-0.29	-0.27	0.38	0.53	0.85	0.37	0.61	0.5	1	
OE	0.53	-0.16	-0.12	0.42	0.52	0.46	0.35	0.49	0.41	0.42	1

To provide evidence for construct validity of latent variables (FP, CR, IBP and LGP) CFA model is assessed. Only valuable indicators of each latent variable would be maintained in model by utilizing factor loading.

6.1.2. Analysis of Reliability and Validity

The study tested the measurement properties of the constructs (latent variables) through confirmatory factor analysis using correlation matrix. CFA was used to evaluate how well the measurement items reflect latent variables in the hypothesized structure.

Composite Reliability (CR) of latent variables and Average Variance Extracted (AVE) of Squared Multiple Correlation (SMC), is presented in Table-8.

Table-8: Reliability and validity analytical results of container terminal supply chain performance measurement model

Perspectives (Constructs)	Criteria	Standardized Factor Loadings	Composite Reliability (CR)	AVE
FP	OR	0.98	0.2824	0.3865
	ROI	-0.31		
	ROA	-0.31		
	NI	0.62		
CP	RPK	1.00	0.8437	0.6544
	NP	0.57		
	RTK	0.79		
BP	EC	0.84	0.8480	0.7363
	CC	0.88		
LG	LC	0.91	0.6593	0.5173
	OE	0.46		

Convergent validity was verified for each factor loading. Factor loadings of ROI and ROA are poor. It indicates that these measurement items are not correlated its assumed theoretical construct.

Composite reliability of for each of the constructs of FP, CP, BP and LG are 0.2824, 0.8437, 0.8480, and 0.6593. Hence, the overall reliability of a set of items loaded on the FP construct is less than threshold value of 0.5 indicates the poor overall reliability of a set of items loaded on the construct.

The average variance extracted (AVE) for each of the constructs of FP, CP, BP and LG are 0.3865, 0.6544, 0.7363 and 0.5173 respectively. AVE value of FP is less than threshold value of 0.5 indicates poor convergent validity. Convergent validity is the degree of confidence we have that a latent variable is well measured by its indicators.

6.1.3. Path Diagram

The path diagram of the model is shown in Fig.3

Figure 3: Path diagram

6.1.4. Model Fit Indices

The model fitting process involves determining the goodness-of fit between the hypothesized model and the sample data. Fit indices of the conceptual model obtained through CFA are shown in the Table-9.

Table-9: Fit indices of structure model

Indicators	Propriety Indicators	Research Findings	Remarks
Absolute Propriety Indicators	$\chi^2 / d.f$	6.41	Lack of fit
	GFI	0.69	Lack of fit
	AGFI	0.46	Lack of fit
	SRMR	0.15	Poor fit
	RMSEA	0.23	Lack of fit
Relative Propriety Indicators	NNFI	0.73	Lack of fit
	NFI	0.80	Lack of fit
	CFI	0.81	Lack of fit

The Chi square goodness of fit metric is obtained as 243.57. The goodness-of-fit index (GFI) of was the very first standardized fit index GFI = 0.69 indicates poor model fit (GFI > .90). Also, AGFI, NNFI, NFI and CFI are obtained as 0.46, 0.73, 0.80 and 0.81 respectively. It indicates overall poor fit of the model with the criteria under the respective construct.

In the study, RMSEA and SRMR are obtained as 0.23 and 0.15 respectively indicates the poor model fit since higher values are obtained. Overall measurement model fitness of 6.41 is

obtained. It indicates that the overall measurement model fitness is poor since $\chi^2/\text{d.f}$ value is more than 3.0.

Hence, the confirmatory factor analyses with 4 constructs having 11 items is not valid measurement model of balanced scorecard of Airlines and proceed for further analysis by removing ROI and ROA factors of financial perspective.

6.2. Confirmatory Factor Analysis Model-II

The proposed model is based on four main constructs of balanced scorecard namely: (i) Financial Perspective (FP) (ii) Customer Perspective (CP) (iii) Internal Business perspective (IBP) and learning and Growth Perspective (LGP)

Based on the literature review, this research suggests the following hypotheses. The detailed discussion of hypotheses development follows.

H1: Operating Revenue and Net Income are the measurement items of financial perspective.

H2: Revenue Passenger Kilometer, Number of Passengers and Revenue Ton Kilometer are the measurement items of Customer perspective.

H3: Energy Cost and Capital Cost are the measurement items of Internal Business Process perspective.

H4: Labour Coat and Operating Expenses per employee are the measurement items of Learning and Growth perspective

6.2.1. Correlation Analysis

In this study, correlation between nine criteria under four perspectives is determined using Lisrel 8.8 to input the same for confirmatory factor analysis. The Correlation matrix so obtained is presented in Table-10.

Table-10: Correlation matrix

Criteria	OR	NI	RPK	NP	RTK	EC	CC	LC
OR	1							
NI	0.635	1						
RPK	0.908	0.652	1					
NP	0.760	0.410	0.573	1				
RTK	0.690	0.467	0.792	0.202	1			
EC	0.865	0.509	0.797	0.669	0.574	1		
CC	0.864	0.574	0.866	0.508	0.723	0.737	1	
LC	0.765	0.382	0.526	0.846	0.369	0.613	0.503	1

To provide evidence for construct validity of latent variables (FP, CR, IBP and LGP) CFA model is assessed. Only valuable indicators of each latent variable would be maintained in model by utilizing factor loading.

6.2.2. Analysis of Reliability and Validity

The study tested the measurement properties of the constructs (latent variables) through confirmatory factor analysis using correlation matrix. CFA was used to evaluate how well the measurement items reflect latent variables in the hypothesized structure.

Composite Reliability (CR) of latent variables and Average Variance Extracted (AVE) of Squared Multiple Correlation (SMC), is presented in Table-11.

Table-11: Reliability and validity analytical results of container terminal supply chain performance measurement model

Perspectives (Constructs)	Criteria	Standardized Factor Loadings	Composite Reliability (CR)	AVE
FP	OR	1.00	0.8158	0.6995
	NI	0.63		
CP	RPK	1.00	0.8401	0.6477
	NP	0.57		
	RTK	0.79		
BP	EC	0.84	0.8505	0.7400
	CC	0.88		
LG	LC	0.91	0.6616	0.5199
	OE	0.46		

Convergent validity was verified for each factor loading. Factor loadings of NP and OE are relatively poor. ROA are poor. It indicates that these measurement items are not strongly correlated its assumed theoretical construct.

Composite reliability of for each of the constructs of FP, CP, BP and LG are 0.8158, 0.8401, 0.8505, and 0.66616.

The average variance extracted (AVE) for each of the constructs of FP, CP, BP and LG are 0.6995, 0.6477, 0.7400 and 0.5199 respectively. AVE values are more than threshold value of 0.5 indicates good convergent validity. Convergent validity is the degree of confidence we have that a latent variable is well measured by its indicators.

6.2.3. Path Diagram

The path diagram of the model is shown in Fig.4.

Figure 4: Path diagram

6.2.4. Model Fit Indices

The model fitting process involves determining the goodness-of fit between the hypothesized model and the sample data. Fit indices of the conceptual model obtained through CFA are shown in the Table-12.

Table-12: Fit indices of structure model

Indicators	Propriety Indicators	Research Findings	Remarks
Absolute Propriety Indicators	χ^2 /d.f	6.78	Lack of fit
	GFI	0.76	Lack of fit
	AGFI	0.48	Lack of fit
	SRMR	0.13	Poor fit
	RMSEA	0.24	Lack of fit
Relative Propriety Indicators	NNFI	0.76	Lack of fit
	NFI	0.85	Lack of fit
	CFI	0.86	Lack of fit

The Chi square goodness of fit metric is obtained as 142.34. The goodness-of-fit index (GFI) of was the very first standardized fit index $GFI = 0.76$ indicates poor model fit ($GFI > .90$). Also, AGFI, NNFI, NFI and CFI are obtained as 0.48, 0.76, 0.85 and 0.86 respectively. It indicates overall poor fit of the model with the criteria under the respective construct.

In the study, RMSEA and SRMR are obtained as 0.24 and 0.13 respectively indicates the poor model fit since higher values are obtained. Overall measurement model fitness of 6.78 is obtained. It indicates that the overall measurement model fitness is poor since χ^2 /d.f value is more than 3.0.

The confirmatory factor analysis with 4 constructs having 9 items is not valid measurement model of balanced scorecard of Airlines. In this context either NP from CP or OE from LP need to be omitted. OE cannot be omitted since the LP construct contains only two criteria. Hence, proceed for further analysis by removing NP factor from customer perspective.

6.3. Confirmatory Factor Analysis Model-III

The proposed model is based on four main constructs of balanced scorecard namely: (i) Financial Perspective (FP) (ii) Customer Perspective (CP) (iii) Internal Business perspective (IBP) and learning and Growth Perspective (LGP)

Based on the literature review, this research suggests the following hypotheses. The detailed discussion of hypotheses development follows.

H1: Operating Revenue and Net Income are the measurement items of financial perspective.

H2: Revenue Passenger Kilometer and Revenue Ton Kilometer are the measurement items of Customer perspective.

H3: Energy Cost and Capital Cost are the measurement items of Internal Business Process perspective.

H4: Labour Coat and Operating Expenses per employee are the measurement items of Learning and Growth perspective

6.3.1. Correlation Analysis

In this study, correlation between nine criteria under four perspectives is determined using Lisrel 8.8 to input the same for confirmatory factor analysis. The correlation matrix so obtained is presented in Table-13.

Table-13: Correlation matrix

Criteria	OR	NI	RPK	RTK	EC	CC	LC	OE
OR	1							
NI	0.635	1						
RPK	0.908	0.652	1					

RTK	0.690	0.467	0.792	1				
EC	0.865	0.509	0.797	0.574	1			
CC	0.864	0.574	0.866	0.723	0.737	1		
LC	0.765	0.382	0.526	0.369	0.613	0.503	1	
OE	0.532	0.419	0.523	0.348	0.489	0.413	0.415	1

To provide evidence for construct validity of latent variables (FP, CR, IBP and LGP) CFA model is assessed. Only valuable indicators of each latent variable would be maintained in model by utilizing factor loading.

6.3.2. Analysis of Reliability and Validity

The study tested the measurement properties of the constructs (latent variables) through confirmatory factor analysis using correlation matrix. CFA was used to evaluate how well the measurement items reflect latent variables in the hypothesized structure.

Composite Reliability (CR) of latent variables and Average Variance Extracted (AVE) of Squared Multiple Correlation (SMC), is presented in Table-14.

Table-14: Reliability and validity analytical results of container terminal supply chain performance measurement model

Perspectives (Constructs)	Criteria	Standardized Factor Loadings	Composite Reliability (CR)	AVE
FP	OR	1.00	0.8158	0.6995
	NI	0.63		
CP	RPK	1.00	0.8929	0.8089
	RTK	0.78		
BP	EC	0.84	0.8505	0.7400
	CC	0.88		
LG	LC	0.91	0.6616	0.5199
	OE	0.46		

Convergent validity was verified for each factor loading. Factor loadings of criteria are relatively acceptable (>0.4). It indicates that these measurement items are moderately correlated its assumed theoretical construct.

Composite reliability of for each of the constructs of FP, CP, BP and LG are 0.8158, 0.8929, 0.8505, and 0.66616 indicates good reliability.

The average variance extracted (AVE) for each of the constructs of FP, CP, BP and LG are 0.6995, 0.8089, 0.7400 and 0.5199 respectively. AVE values are more than threshold value of 0.5 indicates good convergent validity. Convergent validity is the degree of confidence we have that a latent variable is well measured by its indicators.

6.3.3. Path Diagram

The path diagram of the model is shown in Fig.5.

Figure 5: Path diagram

6.3.4. Model Fit Indices

The model fitting process involves determining the goodness-of fit between the hypothesized model and the sample data. Fit indices of the conceptual model obtained through CFA are shown in the Table-15.

Table-15: Fit indices of structure model

Indicators	Propriety Indicators	Research Findings	Remarks
Absolute Propriety Indicators	$\chi^2 / d.f$	2.83	Good fit
	GFI	0.91	Good fit
	AGFI	0.77	Mediocre fit
	SRMR	0.08	Good fit
	RMSEA	0.136	Mediocre fit
Relative Propriety Indicators	NNFI	0.95	Good fit
	NFI	0.95	Good fit
	CFI	0.98	Good fit

The Chi square goodness of fit metric is obtained as 39.63. The goodness-of-fit index (GFI) of was the very first standardized fit index GFI = 0.91 indicates good model fit (GFI > 0.90). Also, AGFI, NNFI, NFI and CFI are obtained as 0.77, 0.95, 0.95 and 0.98 respectively. It indicates overall good model fit with the eight criteria under four constructs.

In the study, RMSEA and SRMR are obtained as 0.136 and 0.08 respectively indicates satisfactory model fit since lower values are obtained. Overall measurement model fitness of 2.83 is obtained. It indicates that the overall measurement model fitness is good since $\chi^2 / d.f$ value is less than 3.0.

Hence In this study, the confirmatory factor analysis with 4 constructs having 8 items is a valid measurement model of balanced scorecard of Airlines.

6.4. CRITIC Method

In this study, relative weights of the criteria of balanced scorecard perspectives are determined through CRITIC method as per methodology.

6.4.1. Standard Deviation

Table-16: Standard deviation of financial ratios

Criteria	OR	NI	RPK	RTK	EC	CC	LC	OE
Standard Deviation	0.2499	0.1945	0.2282	0.1915	0.1863	0.2215	0.2026	0.1127

From Table-16 it is observed that highest standard deviation (0.2499) is obtained with OR (Operating revenue). OE (Operating Expenses) is obtained low standard deviation (0.1127). A high standard deviation implies that, on average, data points are all pretty far from the average. A low standard deviation means most points are very close to the average.

6.4.2. Correlation Coefficient Matrix

Linear correlation coefficients between the financial ratios are determined.

Table-17: Correlation coefficient of criteria

Criteria	OR	NI	RPK	RTK	EC	CC	LC	OE
OR	1	0.635	0.908	0.69	0.865	0.864	0.765	0.532
NI	0.635	1	0.652	0.467	0.509	0.574	0.382	0.419
RPK	0.908	0.652	1	0.792	0.797	0.866	0.526	0.523
RTK	0.69	0.467	0.792	1	0.574	0.723	0.369	0.348
EC	0.865	0.509	0.797	0.574	1	0.737	0.613	0.489
CC	0.864	0.574	0.866	0.723	0.737	1	0.503	0.413
LC	0.765	0.382	0.526	0.369	0.613	0.503	1	0.415
OE	0.532	0.419	0.523	0.348	0.489	0.413	0.415	1

Correlation coefficients are used in statistics to measure how strong a relationship is between two variables. 1 indicates a strong positive relationship. -1 indicates a strong negative relationship. A result of zero indicates no relationship at all. From table 4.10 it is observed that OR is showing high positive correlation with all other criteria. NI is showing high correlation with RPK, EC and CC. RTK is showing high correlation with EC and CC. EC is showing high correlation with EC and LC. CC is showing high correlation with EC.

6.4.3. Measure of Conflict

Measure of conflict is determined and shown in Table-18.

Table-18: Measure of conflict

Criteria	OR	NI	RPK	RTK	EC	CC	LC	OE
Measure of Conflict	2.982	5.370	3.434	5.040	3.871	4.040	4.872	4.985

From Table-18, it is observed that there is a high measure of conflict of 5.370 with NI and low measure of conflict of 2.982 is obtained with OR.

6.4.4. Amount of Information in the Criteria

The amount of information contained in the criteria is determined. The values of Amount of information in the criteria are shown in Table-19.

Table-19: Information content of criteria

Criteria	OR	NI	RPK	RTK	EC	CC	LC	OE
Information Content	0.435	0.654	0.442	0.581	0.450	0.514	0.694	0.435

From Table-19 it is observed that, LC is obtained the highest value (0.694). Hence LC transmits the largest information and it has the highest relative importance for the decision-making process.

6.4.5. Relative Weights of Criteria

Relative weights of criteria are obtained and the relative weights of criteria are shown in Table-20.

Table-20: Relative weights of FRs

Criteria	OR	NI	RPK	RTK	EC	CC	LC	OE
Relative Weight	0.1034	0.1555	0.1051	0.1383	0.1070	0.1222	0.1651	0.1035

From Table-20 it is observed that highest weight of 0.1651 is obtained with LC and the lowest weight (0.1034) is obtained with OR. The relative importance order of criteria is presented below.

Relative importance of FRs: $LC > NI > RTK > CC > EC > RPK > OE > OR$

7. CONCLUDING REMARKS

The present findings provide evidence to support that this is a valid instrument to determine performance dimensions of airlines based on balanced scorecard. This study suggested that four factor model with 08 items in respect of balanced score card for performance evaluation of airlines container terminals had a good fit. In this study performance measurement framework for evaluation of airlines based on balanced scorecard is developed using Integrated CFA and CRITIC methods.

This research aims to develop performance measurement instrument of Airlines based on balanced score card, which can be concluded as follows:

- The reliability test results indicate that performance measurement instrument of Airlines has good reliability, because the calculation results show that CR is ranging from 0.6616 to 0.8929 and VE is ranging from 0.5199 to 0.8089. The value is already qualified and far exceeds the critical limit that is Construct Reliability (CR) Variance extracted (VE) ≥ 0.5 .
- Performance measurement instrument of Airlines consists of three dimensions, eight factors under four constructs, empirically has met the validity and reliability standards.
- The study made in this paper uses objective rating method by implementing CRITIC method. To measure the relative importance of criteria which will be useful for assessment of alternatives.
- In this study, relative importance of eight criteria under balanced scorecard perspectives is obtained as Labour Cost (0.1651), Net Income (0.1555), Revenue Ton kilometer (0.1383), Capital cost (0.1222), Energy Cost (0.1070), Revenue per passenger Kilometer (0.1051), Operating Expenses (0.1035) and Operating Revenue (0.1034) is obtained.
- Similar Relative importance of Operating expenses and Operating revenue is obtained.

Results of the development of this instrument can be used as a reference in the development of similar instruments. In addition, these instruments still need to be tested again with larger criteria and sample by using various other methods and analytical techniques in order to obtain a standardized instrument. Also, the study made in this paper will be useful for performance evaluation of Airlines in specific and any other alternative business organizations in general based on balanced scorecard perspective.

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