Service Quality and Passenger Satisfaction on the Coastal Routes of Southwest Crete

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The aim of this paper is to validate the correctness of the defining variables (categories) used by Sitzimis (2024a) to measure the quality of services provided on the coastal lines of southwest Crete. In this context it tries to determine both how much they affect the overall passenger satisfaction and which one is the most important. This research is both novel and distinct and could hopefully be expanded to include comparable coastal routes around the world and other means of transport. It is also expected to benefit shipowners, passengers, and policymakers by maintaining the level of services provided at a satisfactory level. Methodologically, we have used confirmatory factor analysis to determine the real factors affecting the quality of coastal services in southwest Crete. A non-parametric correlation test has been applied between the degree of satisfaction and the above factors. It has shown that there is a moderate positive correlation. We have tested through multiple regression both the extent to which these factors have an impact on passengers' satisfaction and their relative significance. The resulting evaluation factors are "comfort, safety, land and on-board services", "pricing policy" and "route reliability". They have predicted 63.5% of passengers' satisfaction variance and the first factor is the most significant. Their improvement is expected to stimulate the users' satisfaction. It appears that the five categories used by Sitzimis, and their hierarchical classification, have not been fully confirmed by the factor analysis.

KEY WORDS
~ Passenger transport
~ Service quality
~ User satisfaction
~ Confirmatory factor analysis
~ Regression analysis

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1. INTRODUCTION

The main ports of Crete include Chora Sfakion (Sfakia), Souda, Sougia, Siteia, Rethymno, Palaiochora, Loutro, Kasteli Kissamos, Agios Nikolaos, Agia Roumeli, Heraklion, and Gavdos (Sitzimis, 2024a). Analysing passenger traffic in 2022 the largest market share was gathered by the ports of Heraklion (47.69%), Souda (27.16%) and Agia Roumeli (12.53%) (HSA, 2000-2022). This is normal because they handle significant tourist and domestic passenger flows (Sitzimis, 2024b). In eight (8) of the twelve (12) ports of Crete, passenger traffic decreased from the year 2000 to the year 2021, while in one (1) of the eight (8) it dropped to zero (Agios Nikolaos) (table 1). There is an increase only for the ports of Gavdos, Heraklion, Loutro and Souda (Table 1). It is worth mentioning that while the passenger traffic in all Greek ports increased by 99% during this period, the traffic for the ports of all Crete, south-west Crete, north-west Crete and north-east Crete reduced by approximately 18%, 39%, 14%, and 8% respectively (Table 1). This is possibly due to the intense tourism development of other island destinations in Greece and the consequent competition that has been created (Sitzimis, 2024b). The biggest reductions tooκ place in the ports of Rethymnon (-78.27%), Sitia (-60.04%) and Kasteli Kissamos (-52.06%) (Table 1), as often the coastal companies have stopped sailing. The low occupancy rates recorded by ships serving passengers in these ports clearly jeopardise the companies' financial viability.

	Total passengers boarded in Cretan and Greek ports	**2000**	**2021**	**% change**
	Crete	1,178,746	968,079	-17.87%
	South-west Crete	*306,460*	*188,419*	*-38.52%*
	North-west Crete	*349,601*	*300,032*	*-14.18%*
	North-east Crete	*522,685*	*479,628*	*-8.24%*
	Greece	12,770,576	25,422,673	99.07%
Geographical location	**Passengers boarded in Cretan Ports**	**2000**	**2021**	**% change**
South-west Crete	Gavdos	0	5,624	increase
North-east Crete	Heraklion	458,507	468,565	2.19%
South-west Crete	Agia Roumeli	187,155	96,691	-48.34%
North-east Crete	Agios Nikolaos	36,490	0	nullification
North-west Crete	Kasteli Kissamos	19,250	9,228	-52.06%
South-west Crete	Loutro	23,864	28,380	18.92%
South-west Crete	Palaiochora	11,291	7,925	-29.81%
North-west Crete	Rethimno	105,376	22,894	-78.27%
North-east Crete	Siteia	27,688	11,063	-60.04%
South-west Crete	Sougia	10,100	5,756	-43.01%
North-west Crete	Souda	224,975	267,910	19.08%
South-west Crete	Sfakia	74,050	44,043	-40.52%

Table 1. The percentage change in the number of boarded passengers in Cretan ports between the years 2000 and 2021

Gavdos, Agia Roumeli, Loutro, Palaiochora, Sougia, and Chora Sfakion are the principal ports in southwest Crete (Sitzimis, 2024a). Between these ports there are coastal routes with strong passenger demand, mainly in summer months. Similar to the majority of Greek coastal lines, they are well-known tourist destinations with seasonal features (Sitzimis, 2022; Sitzimis, 2021; Goulielmos & Sitzimis, 2014; Boile, Theofanis, Perra, & Kitsios, 2023; Diakomihalis & Lagos, 2011). Sitzimis (2024a), sought to examine the demographic and socio-economic passenger characteristics, the prevailing market conditions, and the perceptions of the Cretan people about the quality of services offered along this region's coastal routes. He focused on the "Sfakia-Agia Roumeli" coastal line (S-A), which constantly attracts the biggest passenger traffic, and the coastal firm (CC), which enjoys monopoly power in the market.

The aim of this article is on the one hand to validate the correctness of the defining variables used by Sitzimis (2024a) to measure the quality of services provided on the coastal lines of southwest Crete and, on the other hand, to determine on both how much they affect the overall passenger satisfaction with CC and which one is the most important. Concerning the assessment of coastal service quality in southwest Crete and the companies operating there, we have noticed substantial gaps in literature. Sitzimi's (2024a) literature review is characteristic and revealing. We will not expand further, as our ultimate goal is specific: to evaluate the correctness of the variables he used and not to ascertain the results of other researchers.

The proposed research is therefore both novel and distinct, giving plenty of possibility for future in-depth study. The analysis could hopefully be expanded to include comparable travel destinations and routes around the world (highly seasonal and short-haul coastal routes), as well as enrich the current body of knowledge on this issue. Regarding managerial implications, shipowners could find the following analysis helpful. It may lead to the ascertainment of passengers' satisfaction with the quality of the service provided on highly seasonal coastal lines. This can help coasters execute their business plan and implement smart marketing techniques to attract clients and serve them in the most efficient way. It may also increase the capacity demand during off-peak periods by taking market share away from the competing means of transport. The best way to do this is to improve services associated with the highest passenger dissatisfaction. In any case, the users of the transport service will benefit from the quality improvement. This quality upgrade will also help the policymakers, since in periods of reduced demand or in cases of subsidised (barren) lines the level of the quality of the shipping services will be maintained at a satisfactory level. There could be theoretical ramifications as well. The same strategy might be applied for other forms of transportation, such as trains, airplanes, and, of course, cruisers. This demonstrates that the same methodological analysis can find fertile ground in any transport sector and be the subject of thorough scientific research.

Consequently, the research questions we attempt to answer are the following three (3):

1) *Which are the real evaluation factors of the quality of provided coastal services in S-A coastal line?*
2) *Are the real evaluation factors of the quality of provided coastal services related to the overall satisfaction with CC in S-A coastal line?*
3) *How much do the real evaluation factors of the quality of provided coastal services affect the overall satisfaction with CC in S-A coastal line and which is the most important of them?*

At a structural level, after analysing Cretan ports and the coastal lines of southwest Crete, we have described the research database, as it emerges from Sitzimis point of view (Sitzimis, 2024a). With an emphasis on the "Sfakia-Agia Roumeli" (S-A) coastal line, we have conducted a confirmatory factor analysis to identify the real factors influencing the quality of coastal services in southwest Crete. A non-parametric correlation test has been performed to determine the relationship between the level of satisfaction and the assessment criteria as listed by Sitzimis. We have used multiple regression to determine the extent to which these factors influence passenger satisfaction and their relative significance.

2. DESCRIPTION OF THE RESEARCH DATABASE

As mentioned above, this particular analysis is based on cross-checking the correctness of Sitzimis (2024a) research results. Going deeper, primary research, from January 12 to April 13 of 2023, was conducted using structured questionnaires and yielding a sample of 260 respondents. There were 126 women and 134 males, most of whom were between the ages of 25 and 54 and resided in Chania's urban areas. Essentially recent high-school and college graduates, most of them are married with no children and work as employees in the private sector. In their lifetime, 49.2% of them have taken this route 1-3 times, whereas 46.5% did not in the past two years (2021–2022).

Five categories of descriptive data for the "S-A" coastal line were associated to thirty (30) survey questions: a) the "route reliability" category, b) the "pricing policy" category, c) the "ship comfort and safety" category, d) the category "land and on-board services", and e) the category "preference for CC over potential competition". Twenty-six (26) of them related to the Likert scale: "1: not at all, 2: slightly, 3: moderately, 4: very, 5: extremely" and four (4) of them to the Likert scale: "1: worse, 2: relatively worse, 3: the same, 4: relatively better, 5: better". The minimum and maximum value of the answer, the mean, the median, the mode, and the standard deviation were all recorded for each question in each category (Saunders, Lewis, & Thornhill, 2019; Gnardellis C. , 2013). In addition, the 5-point Likert scale-based percentage distribution of the replies was applied, and the means of central tendency and standard deviation measurements were extracted. Responses that averaged 1-2 on the scale indicated dissatisfaction, those averaging 4-5 conveyed satisfaction, and response 3 indicated neither dissatisfaction nor satisfaction. The author noted that it is inappropriate to derive inferences from Likert scales by applying the mean (Sitzimis, 2024a). We cannot average out the "not at all" and "extremely" responses or assume equal emotional distance between the "very" and "extremely" responses. It is not relevant in ordinal variables as a measure of central tendency. Additionally, the respondents frequently avoid revealing their intentions and mostly respond with the answer "moderately". He ultimately decided to use means to make his analysis more straightforward because, according to his research, it yields the same results as the mode and the median. Nevertheless, as will be analysed below, the most appropriate methodology in these cases is the confirmatory factor analysis.

Sitzimis (2024a) research results show that leisure was the primary motivation for travelling on this line. The majority of travellers choose this route with their families, without taking their car with them. According to the findings, participants are not entirely satisfied with CC and its services. The general degree of respondents' satisfaction with CC on the S-A coastal line is concerned with relative contentment, rather than dissatisfaction. Approximately 12.3% are unsatisfied ("not at all-slightly"), 44.6% are neither dissatisfied nor satisfied ("moderately" replies), and 43.1% are satisfied ("very-extremely" answers). However, the latter number is skewed toward the answer "very" (31.2%) and away from the answer "extremely" (11.9%). Moreover, they consider "safety on-board" as the most crucial aspect of quality, are worried about the "ships' age", and are willing to pay extra for any quality enhancements. Their complaints, in decreasing order of preference, are as follows: 1. Preference for CC over potential competition, 2. Pricing policy, 3. Comfort on-board and Safety, 4. Route reliability, 5. Land and on-board services. Additionally, non-parametric inferential tests indicate that passengers who travel with their vehicle are happier than those who do not, and that their level of satisfaction increases the more frequently they use these lines, and the more frequently they travel for business.

3. RESEARCH METHODOLOGY

The two main properties of a question scale are reliability and validity. Reliability refers to the internal consistency of the answers on the scale, i.e. if they show a high correlation with each other or with the characteristics being measured. Conceptual construct validity investigates whether the scale measures what it is designed to measure (Babbie, 2018; Zafeiropoulos, 2015; Dimitriadis, 2016; Schindler, 2019). In this case, either exploratory factor analysis or confirmatory factor analysis is applied.

Confirmatory factor analysis assumes that the exact structure of the factor model based on existing theory is given (Anastasiadou, 2012). It is used in those cases where we rely on questionnaires that have been used in previous research and have therefore been evaluated for the reliability of their contents (content validity) and their structure (construct validity) (Zafeiropoulos, 2015). It helps to validate the determinant variables used to measure specific constructs (factors). In the shipping sector, several passenger satisfaction surveys have surfaced over time (Yuen & Thai, 2015; Lekakou , Pallis, Vaggelas , & Vitsounis , 2011; Kahn, Hadiuzzaman, Das, Rahman, & Shimu, 2018; Grigoroudis & Siskos, 2004; Hensher, Stopper, & Bullock, 2003; Tyrinopoulos & Aifadopoulou, 2008; Pantouvakis, 2010). This should have prompted us to perform a confirmatory factor analysis to ensure that we have chosen the right questions for each assessment axis (scale) and to determine which

axes (scales) are best matched the data we had. In fact, the exploratory factor analysis would be a preferable option because the questionnaire for the current study has been combined from other similar surveys and a related research for S-A coastal line has not yet been carried out. This would yield suitable continuous variables to be used in various inferential tests. Thereby, using the multiple regression method, we have been able to forecast the general level of satisfaction of CC's passengers, the overall predictive power of the independent variables for evaluating the quality of the given coastal services, and their importance ranking.

A necessary condition for using the above method is for the ratio of subjects to variables to be at least 10:1 (Roussos & Tsaousis, 2020; Dimitriadis, 2016). This is the case in our research, as the sampling we have followed included 260 participants and 24 variables (Table 2). We emphasise that Sitzimis (2024a) included in his analysis 30 question-variables, also using the quality variable "preference for CC over potential competition" (6 questions). Here we have decided to ignore it following the international bibliography on the issue (Cole, 2005; Sambrakos, 2018; Profillidis, 2016; Goulielmos & Sitzimis, 2014; Hejazi & Fawzy, 2021). Besides, by adding this fifth variable to the factor analysis, the total percentage of the variance explained by all the factors together (four factors arise) is 69%, while with the remaining four variables it is 72%, as will be seen below. Also, in relation to the 24 questions using a Likert scale, the sample size was quite satisfactory because it was about forty times larger than the questions in the questionnaire and exceeded the number of twenty people for each variable. At the same time, it has been found that the variables are sufficiently correlated with each other (Pearson's $r<0.2$), but not to a very high degree (Pearson's $r<0.8$), they show linearity and do not reach extreme values (Roussos & Tsaousis, 2020).

Therefore, to test the construct-structure factorial validity of the proposed measurement scale, confirmatory factor analysis has been applied (1st research question). It is indicated in our case because we have variables expressing the degree of satisfaction or desire, the sample size is sufficient, and the observations are independent of each other (Anastasiadou, 2012; Dancey & Reidy, 2020). The extraction method is Principal Component Analysis (PCA) and the axes have been rotated using the Varimax method (maximum variance rotation). This means that the extracted factors (components) are linearly uncorrelated (Roussos & Tsaousis, 2020). The number of factors retained is based on the criterion of eigenvalue (Eigenvalue≥1), and the reliability of the questions for the specific sample has been calculated with the help of Cronbach's α coefficient (Anastasiadou, 2012; Dimitriadis, 2016).

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) has been used to test whether the data is suitable for factor analysis (Dancey & Reidy, 2020). To check if data analysis makes sense, that is, if the correlation matrix of the variables involved in the analysis differ statistically significantly from unity, Bartlett's Test of Sphericity (BTS) has been used (Norris, Qureshi, Howitt, & Cramer, 2017). Statistical Package of Social Sciences 21 (SPSS) is the statistical data processing software and 5% is the level of significance for all analyses (Gnardellis C. , 2013; Gnardellis C. , 2019). Only to check for sphericity, we have opted, to obtain greater rigour, for a significance level of 1%. Questions with loadings above 0.35 have been taken into account for the interpretation and construction of the axes, because the sample involved approximately 250 respondents (Dimitriadis, 2016; Anastasiadou, 2012). Factors resulting from factor analysis have been used as continuous variables for further inferential tests.

In order to answer the 3rd research question, we have used the multiple regression method (Chalkos, 2020; Dancey & Reidy, 2020; Dimitriadis, 2016; Norris, Qureshi, Howitt, & Cramer, 2017; Roussos & Tsaousis, 2020). Having at our disposal the continuous variables obtained through the factor analysis, we have attempted to predict the general degree of passengers' satisfaction with CC. Our goal has been to estimate the overall predictive power of the variables used. In other words, to determine the total percentage of variance explained by the predictor variables participating in the regression equation.

The sample size required to obtain robust results has been satisfactory and sufficient. Indicatively, the number of research participants should be 50+8 times the number of predictive factors (Dancey & Reidy, 2020). In our case 50 + (8x3) = 74 people, a number much smaller than the 260 questionnaires we had at our disposal. Initially, we have chosen the Force Entry (ENTER) method as the method for entering the predictor variables into the regression (Dimitriadis, 2016). Our desire has been to create a model with all available independent variables and then evaluate both this and the resulting coefficients and indicators. This is the most appropriate method considering a small number of independent variables at our disposal, and the fact that we did not know which of the independent variables would create the best prediction equation (Roussos & Tsaousis, 2020).

4. RESULTS

Table 2 offers particularly useful conclusions. The KMO sample suitability index=0.943>0.7 shows that the sample data is suitable for processing and the BTS sphericity test ($p<0.001$) shows that the confirmatory factor analysis is meaningful (Anastasiadou, 2012; Roussos & Tsaousis, 2020). The grouping of data has been done based on the correlation between them. The aim has been capturing the factors that best describe individuals' aspects regarding their satisfaction with CC. Based on the analysis, three uncorrelated factors have emerged, which explains 71.78% of the total inertia of the data (Dancey & Reidy, 2020). This is of great importance because, on the one hand, the specific number of factors is 3 to 5 times smaller than the original variables and, on the other hand, the number of variables per factor is not less than 3 (Anastasiadou, 2012). The eigenvalue diagram (screen plot) agrees with the Kaiser-Guttman criterion that the significant factors is 3, since, after the third eigenvalue, the "break" of the vertical line is very clear (Dimitriadis, 2016; Norris, Qureshi, Howitt, & Cramer, 2017). From the fourth eigenvalue onwards, the path of the line is relatively parallel to the horizontal axis.

The coefficient of internal consistency (reliability) Cronbach's α is statistically significant and equal to 96.3% for all the questions. Therefore, the scale of 24 questions has been considered reliable in the sense of internal consistency. It exceeds 80%, which is an extremely good value for the internal consistency of the conceptual construct of the scale (Dimitriadis, 2016). If we proceed to exclude units, i.e. to standard values of the variables, then Cronbach's α coefficient takes a value of $\alpha=0.964$, i.e. it remains almost the same, which means that even if we increase the number of items, the α coefficient will again have the same value (Anastasiadou, 2012).

The variables (items) have an average value ranging from 2.831 to 3.792. This means that the variables that examine people's attitudes towards CC have a range of 0.962. The scores concerning the scale in its entirety, i.e. all 24 items, present an average of 79.53, a variance of 343.926 and a standard deviation of 18.545 units. Additionally, the internal consistency coefficient (Cronbach's a) has shown excellent consistency and reliability separately for each new factor (>0.8) and is equal to 90.5%, 95.2%, and 94.8% for the 1st, 2nd, and 3rd factorial axis respectively. From the communality values, for each question we have found values greater than 0.5. This means satisfactory quality of measurements from the three-factor model (Anastasiadou, 2012). If any of the items that make up the scale are removed, the degree of scale reliability will decrease.

Based on respondents' opinions, the first factor (F1), which is explained through the Varimax rotation 27.15% of the total variance, is mainly loaded by questions R20, C30-C33 and S34-S38 (Table 2;3). It essentially captures people's opinions on the comfort, safety, and land and on-board services offered by CC to its passengers on S-A coastal line. According to the value of Cronbach's α coefficient, if we proceed with unit exemption, i.e. standard values of the variables, the coefficient remains the same. This means that it will have the same value (0.948), even if we increase the number of items. The variables (items) have a mean ranging from 3.035 to 3.792 units, i.e. a range of 0.758. If any of the ten items that make up the scale are removed, the degree of scale reliability will decrease.

In the second factor (F2), which explains 26.09% of the total variance, questions P22-P29 load is shown in Tables 2 and 3). It consists of people's opinions about CC's pricing policy on S-A line. According to the value of Cronbach's α coefficient, if we proceed with unit exemption, i.e. standard values of the variables, the coefficient remains almost the same. This means that it will have the same value (0.952) even if we increase the number of items. The variables (items) have a mean ranging from 2,862 to 3,254 units, i.e. a range of 0.392. If any of the eight items that make up the scale are removed, the degree of reliability of the scale will decrease.

In the third factor (F3), which explains 18.24% of the total variance, questions R15-R19 and R21 loads are shown in Tables 2 and 3). This captures respondents' views on the reliability of CC's S-A route. According to the value of Cronbach's coefficient α, if we proceed with the exemption of units, that is to standard values of the variables, the coefficient is almost the same (0.905). The variables (items) have a mean ranging from 2.831 to 3.658 units, i.e. a range of 0.827. If any of the six items that make up the scale are removed, the degree of scale reliability will decrease.

The factor scores, i.e. the values of the new variables, for each variable, have been obtained through the regression method and are standardised. Essentially, we have chosen to save factor indices as variables. This method is based on the least squares method (OLS), between the actual values and those predicted by the factor model, giving factors with a zero mean (Anastasiadou, 2012). Consequently, the following continuous variables have emerged, which have been used in the inferential tests of the survey data:

F1: The contribution of comfort, safety, and land and on-board services to passenger satisfaction.
F2: The effect of pricing policy on passenger satisfaction.
F3: The contribution of route reliability to passenger satisfaction.

It is important to mention that negative loadings mean that the variable is negatively correlated with the factor, while positive loadings mean that it is positively correlated (Dancey & Reidy, 2020). In our case all the loadings show a positive sign. Having at our disposal the continuous variables obtained through the factor analysis ("comfort, safety, land and on-board services"-F1, "pricing policy"-F2, "route reliability"-F3) we have attempted to predict the general degree of passengers' satisfaction with CC (SD), through multiple regression analysis. Initially, after renaming F1 to CSS, F2 to PP, and F3 to RR, we have sought additional statistical information to check the four (4) conditions that have to be met for the correct use of the method (Dancey & Reidy, 2020).

The 1st condition is about testing for a correlation between the predictor variables and the criterion variable (Roussos & Tsaousis, 2020). To calculate the intensity of the correlation, we usually use the correlation coefficients of Pearson, Spearman, and Kendall, depending on the type of variables we have (Dimitriadis, 2016). The main difference is that the first one is calculated based on the data, while the other two are based on data magnitude orders (Norris, Qureshi, Howitt, & Cramer, 2017). Pearson's correlation coefficient refers to quantitative variables and parametric tests (Dancey & Reidy, 2020); i.e. it is used when the values of each group come from a population that presents a normal distribution, when the variances of the populations are approximately equal (that is, there is homogeneity of the variances) and when we have many sample observations. Spearman and Kendall's tau-b correlation coefficients relate to non-parametric tests and qualitative or categorical variables (Dancey & Reidy, 2020). We choose Spearman's correlation coefficient (although not always) when the values of each group come from a population that does not follow a normal distribution and when there is linear and monotonic correlation between the variables (Gnardellis C. , 2019; Roussos & Tsaousis, 2020).

To determine whether there is a correlation between SD and the real factors evaluating the quality of services provided (CSS, PP and RR) (2nd research question), we first had to proceed with tests for the normality or non-normality of our data (Gnardellis C. , 2019).

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.963	.964	24

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.314	2.831	3.792	.962	1.340	.090	24
Item Variances	1.104	.890	1.381	.491	1.552	.023	24

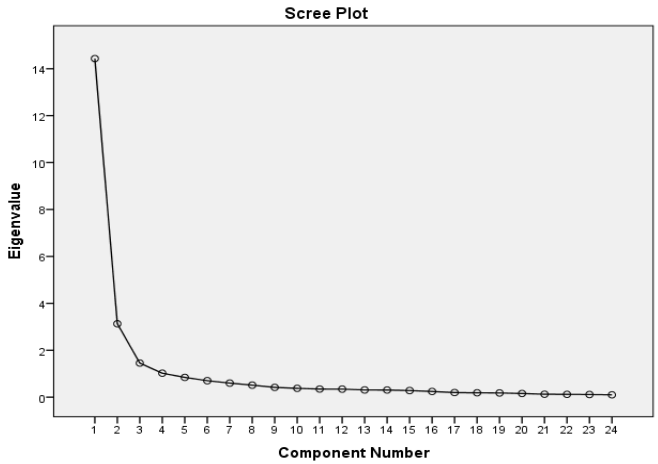
Scale Statistics

Mean	Variance	Std. Deviation	N of Items
79.53	343.926	18.545	24

KMO and Bartlett's Test[a]

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.943
Bartlett's Test of Sphericity	Approx. Chi-Square	6063.636
	df	276
	Sig.	0.000

a. Based on correlations



Total Variance Explained

		Initial Eigenvalues[a]			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
		Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Rescaled	1	14.432	54.479	54.479	13.084	54.516	54.516	6.515	27.145	27.145
	2	3.129	11.811	66.290	2.706	11.277	65.793	6.262	26.094	53.239
	3	1.453	5.485	71.775	1.365	5.687	71.480	4.378	18.241	71.480

Table 2. The application of confirmatory factor analysis on the "Sfakia-Agia Roumeli" coastal line

Category	Question	Questions' content	Factors	Scale items	Factor loading		
					F1	F2	F3
Land and on-board services	S36	How satisfied are you with the passengers' boarding-disembarkation process?	**F1:** Comfort, security, land and on-board services	R20	**0.549**	x	0.548
	S37	How satisfied are you with the vehicles' boarding-disembarkation process?		C30	**0.638**	x	0.373
	S38	How satisfied are you with the land and on-board services?		C31	**0.723**	x	x
	S34	How satisfied are you with the ship's crew (willingness, service)?		C32	**0.691**	x	x
	S35	How satisfied are you with the service time at the ticket agency?		C33	**0.712**	x	x
Comfort and security	C31	How satisfied are you with the cleanliness on-board?		S34	**0.763**	x	x
	C33	In general, how satisfied are you with the company's ship?		S35	**0.753**	x	x
	C32	How satisfied are you with the feeling of safety on-board?		S36	**0.807**	x	x
	C30	How satisfied are you with the shared areas of the ship?		S37	**0.780**	x	x
Pricing policy	P23	How satisfied are you with the ticket price for transporting your car (up to 4 meters)?		S38	**0.765**	x	x
	P24	How satisfied are you with the ticket price for transporting your car (over to 4 meters)?	**F2:** Pricing policy	P22	x	**0.758**	x
	P29	In general, how satisfied are you with the company's pricing policy?		P23	x	**0.862**	x
	P26	How satisfied are you with the ticket price for transporting your motorcycle (over 250cc)?		P24	x	**0.851**	x
	P25	How satisfied are you with the ticket price for transporting your motorcycle (up to 250cc)?		P25	x	**0.815**	x
	P22	How satisfied are you with the passengers' ticket price?		P26	x	**0.828**	x
	P27	How satisfied are you with the company's ticket price offers for children (5-12 years old)?		P27	0.353	**0.756**	x
	P28	How satisfied are you with the company's ticket price offers for students?		P28	x	**0.742**	x
Route reliability	R20	How satisfied are you with the overall travel time?		P29	x	**0.837**	x
	R18	How satisfied are you with the frequency of the company's routes in the winter months (1/11-31/3)?	**F3:** Route reliability	R15	0.375	x	**0.675**
	R17	How satisfied are you with the scheduled departure-arrival time of the company's ship in the winter months (1/11-31/3)?		R16	0.368	x	**0.664**
	R15	How satisfied are you with the scheduled departure-arrival time of the company's ship in the summer months (1/4-31/10)?		R17	x	x	**0.790**
	R21	In general, how satisfied are you with the company's routes?		R18	x	x	**0.808**
	R16	How satisfied are you with the frequency of the company's routes in the summer months (1/4-31/10)?		R19	0.473	x	**0.648**
	R19	How satisfied are you with the punctuality of the company's schedules?		R21	0.454	x	**0.668**

Table 3. The results from the confirmatory factor analysis on the "Sfakia-Agia Roumeli" coastal line

The normal distribution test has been done with the Kolmogorov-Smirnov test (K-S) which tests the null hypothesis that the distribution of our data does not differ from the normal (Chalkos, 2020; Saunders, Lewis, & Thornhill, 2019). It essentially compares the distribution of our data to a normal distribution, which has a mean and standard deviation equal to the mean and standard deviation of our sample (Roussos & Tsaousis, 2020). According to K-S test, the results, for the four (4) variables of our analysis, are: D(260)=0.25, p<0.001, D(260)=0.04, p>0.001, D(260)=0.05, p>0.001 and D(260)=0.04, p>0.001. We have noticed that one (1) of the four (4) variables does not form a normal distribution (SD), consequently accepting the null hypothesis and using the Spearman rho correlation coefficient. We have found that between SD and CSS, PP, RR there is a moderate positive correlation (0.42<rho<0.69) and the condition is satisfied (table 4) (Anastasiadou, 2012; Roussos & Tsaousis, 2020; Saunders, Lewis, & Thornhill, 2019). In particular, our main aim has been to establish whether there is a statistically significant correlation and the direction between the SD variable and the 3 real quality factors (CSS, PP, RR). The results show that in each case there is a moderate positive correlation (rho(260)>0.42), with the result being statistically significant [p<0.001 (p<α=0.05)] (Table 3) (Dancey & Reidy, 2020). That is, the probability that the specific result is due to random factors is almost zero. Consequently, we have rejected the null hypothesis that there is no positive correlation between the variables. Indicatively, this means that the more positive the respondents' perception of the real factors CSS, PP and RR, the more positive their perception of the overall satisfaction with CC (SD). Interestingly, no negative correlations are found at all.

			SD	CSS	PP	RR
Spearman's rho	**SD**	Correlation Coefficient	1.000	.513**	.425**	.439**
		Sig. (2-tailed)		.000	.000	.000
		N	260	260	260	260
	CSS	Correlation Coefficient	.513**	1.000	.016	.036
		Sig. (2-tailed)	.000		.802	.563
		N	260	260	260	260
	PP	Correlation Coefficient	.425**	.016	1.000	.014
		Sig. (2-tailed)	.000	.802		.821
		N	260	260	260	260
	RR	Correlation Coefficient	.439**	.036	.014	1.000
		Sig. (2-tailed)	.000	.563	.821	
		N	260	260	260	260

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4. Spearman rho correlation coefficient results as presented in SPSS Viewer

The 2nd condition is related to the independence or non-independence of the residuals (Roussos & Tsaousis, 2020). The result of the Durbin-Watson criterion has been 1.934 (close to 2), and therefore there is no autocorrelation between the residuals (table 5) (Dimitriadis, 2016). The 3rd condition tests the phenomenon of multicollinearity, i.e. the existence or not of a correlation between the independent variables. We have observed the tolerance index to be greater than 0.1 and the variance inflation factor (VIF) less than 10 (table 5). Thereby the existence of this statistical phenomenon has not been justified (Dimitriadis, 2016). The normality of residuals describes the 4th condition (Roussos & Tsaousis, 2020). By observing the histogram of the standardised residuals, we could claim that the condition of normality is met. The absence of heteroscedasticity in the residuals is also characteristic, i.e. there is a uniform dispersion of the observations around the regression line (Roussos & Tsaousis, 2020). This resulted after finding Cook's distance to detect outliers (the maximum and

minimum values of the distances do not exceed unity) (Hair, Anderson, Tatham, & Black, 1998). We could draw the first critical inference for our predictive model after confirming that the multiple regression method's requirements have been satisfied.

In Table 5 it is clearly seen that the three (3) predictive variables explain a total of 63.5% of the total variation of the criterion variable (R2=0.635) (Chalkos, 2020). In fact, the adjusted R2 coefficient shows very close values to those of R2 (R2=0.635 and adjusted R2=0.631). This means that if the model were based on the population, it would explain about just 0.4% less variance (Dancey & Reidy, 2020). The result of anova analysis [F(3,256)=148.478, p<0.001] (Table 5) shows that the predictive model tested significantly improves our ability to predict the criterion variable compared to not applying the model (Roussos & Tsaousis, 2020).

In relation to the regression coefficients, the coefficient α is 3.408, while the coefficients b1, b2, b2 are 0.453, 0.400, 0.382 respectively (Table 5). All the coefficients of the independent variables are statistically significant (p<0.001). Of interest is the column with the standardised β (beta) regression coefficients. We find that the most important predictor variable is CSS (0.505) (Dimitriadis, 2016). This means that when the value of the CSS variable changes by one standard deviation, the value of the SD variable changes by 0.505 standard deviation units (Roussos & Tsaousis, 2020). The standard deviation for the CSS variable is 1.000, and the standard deviation for the SD variable is 0.898 (table 5). This represents a change of 0.453 units (0.898x0.505) for the SD variable each time the value of the CSS variable increases by 1,000 units (Roussos & Tsaousis, 2020). In fact, since the standardised beta coefficient is positive, this change will be in the positive direction (greater degree of satisfaction with CC) (Norris, Qureshi, Howitt, & Cramer, 2017). In terms of importance for predicting the degree of individuals' satisfaction with CC, the variables PP (0.446) and RR (0.426) follow in order.

In conclusion, after calculating the basics of multiple regression method, the selection model (regression equation) we have arrived at is:

$$SD = 3.408 + 0.453\,(CSS) + 0.400\,(PP) + 0.382\,(RR)$$

In other words, for each unit of change in "comfort, safety, land and on-board services" on the S-A line the predicted degree of people's satisfaction with CC (SD) will increase by 0.453 units, provided that the two (2) other variables (PP, RR) remain unchanged. Accordingly, for each unit change in "pricing policy" it will increase by 0.400 units and for each unit change in "route reliability" it will increase by 0.382 units (always holding the other variables constant). Particularly for the PP variable, the following should be mentioned: on average, the participants' satisfaction with the company's pricing policy ranges from "not at all" to "moderate" by 65.7% (Sitzimis, 2024a). Therefore, the majority would prefer lower prices. If their satisfaction with them improved by 1-unit, overall satisfaction with the company would increase by 0,400 units.

Model Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
	0.797	.635	.631	.546	.635	148.478	3	256	.000	1.934

Anova Analysis		Sum of Squares	df	Mean Square	F	Sig.
	Regression	132.585	3	44.195	148.478	.000[b]
	Residual	76.199	256	.298		
	Total	208.785	259			

Coefficients	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	3.408	.034		100.714	.000		
REGR factor score 1 for analysis 1	.453	.034	.505	13.372	.000	1.000	1.000
REGR factor score 2 for analysis 1	.400	.034	.446	11.813	.000	1.000	1.000
REGR factor score 3 for analysis 1	.382	.034	.426	11.272	.000	1.000	1.000

Table 5. Model summary obtained through multiple regression analysis for the "Sfakia-Agia Roumeli" coastal line

5. DISCUSSION

The preceding analysis shows that the five (5) quality categories used by Sitzimis (2024a) to assess users' satisfaction on the S-A coastal line are not fully confirmed by the factor analysis. However, the content of these categories is included in the resulting factors, but with a different structure. Only the category "preference for CC over potential competition" does not appear, a fact expected based on the international literature conclusions on the specific issue (Sitzimis, 2024a).

Sitzimis concludes that "safety on-board" is the most crucial aspect of quality. Our analysis shows that this aspect is partially confirmed again. Safety on-board must be combined by both comfort and land and on-board services, so that there is the greatest possible user satisfaction.

The overall level of respondents' satisfaction with CC along the S-A coastal line is concerned with relative satisfaction rather than dissatisfaction. In any case, Sitzimis argues that passengers are not completely satisfied with the level of services provided. Furthering his analysis, we have found that the improvement of the CSS, PP and RR factors can improve the expected level of passenger satisfaction.

It is obvious that in terms of managerial consequences, shipowners may find the previous analysis useful. It could lead to an assessment of passengers' satisfaction with the level of service offered on highly seasonal coastal routes. This can assist coasters in carrying out their business plan and implementing effective marketing tactics to attract the service users in the most efficient manner. It may also raise capacity demand during off-peak periods by reducing market share for rival modes of transportation. In any scenario, users of the transportation service will profit from the quality enhancement. Furthermore, this quality update will benefit policymakers by ensuring that the quality of shipping services is maintained at a reasonable level during periods of low demand or in circumstances of subsidised (barren) lines.

The proposed research is thus both original and distinct, leaving lots of room for future in-depth investigation. The investigation might be broadened to include comparable travel locations and routes from around the world (particularly seasonal and short-haul coastal routes), thereby enriching the present body of knowledge on this topic. The same method may be used for various modes of transportation, including trains, planes, and, of course, cruisers. This illustrates that the same analytical study may be used to any transportation sector and subjected to rigorous scientific investigation.

In relation to potential limitations of the study, the research and the structured questionnaires might be extended to encompass the summer season, considering the perspectives of both visitors and the Cretans in general. Sitzimis was limited to the January-April period and to respondents from Crete. Moreover, the sample chosen by the respondents may have been representative or in other words probabilistic from a statistical standpoint.

6. CONCLUSIONS

The main ports in southwest Crete are those of Gavdos, Agia Roumeli, Loutro, Palaiochora, Sougia, and Chora Sfakion. Sitzimis (2024a) attempted to record the characteristics and attitudes of passengers towards the quality of services provided on these coastal routes. He focused on CC and the S-A line. The primary research was carried out utilising structured questionnaires. The purpose of this paper is to test the validity of the defining variables used by him (he used five (5) quality categories), to find the real factors affecting the quality of services offered and to ascertain which variable is most significant in terms of its impact on overall passenger satisfaction with CC. In this context confirmatory factor analysis and multiple regression analysis have been carried out.

KMO sampling adequacy and Bartlett's test of sphericity indicate that the characteristics of our data allow the use of confirmatory factor analysis. To consolidate the factor structure of the creativity scale, the PCA method has been applied, while Varimax has been chosen as the rotation method. The results show a factorial solution of three (3) factors, which explains 71.48% of the total variance. The first factor, named "comfort, safety, land and on-board services", explains 27.14% of the total variance. The second factor, named "pricing policy", explains 26.09% of the total variance, and the third factor, named "route reliability", explains 18.24% of the total variation.

To determine whether there is a correlation between the overall satisfaction with CC and the real factors evaluating the quality of services provided we have found that there is a moderate positive correlation. This means that the more positive the respondents' perception of the real factors CSS, PP and RR, the more positive their perception of the overall satisfaction with CC (SD). Interestingly, no negative correlations are found at all.

After the necessary tests, a multiple regression analysis, with the ENTER method, was carried out to examine whether the above real factors effectively predict the degree of passenger satisfaction with CC. These factors predict 63.5% of the variance of the criterion variable, all being statistically significant. Compared to not using the model, anova analysis has revealed that the predictive model examined greatly the dependent variable. The variable CSS is the most important variable, followed by the variables PP and RR. Provided that the two (2) other variables (PP, RR) remain constant, the expected level of people's satisfaction with CC (SD) will improve by 0.453 units for each unit change in "comfort, safety, land and on-board services" on the S-A line. As a result, it will grow by 0.400 units for each unit change in "pricing policy", and by 0.382 units for each unit change in "route reliability".

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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