



## Prioritization of the Influential Factors of Corporate Social Responsibility in the Iranian Airline Industry by CRITIC and COPRAS Methods

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### Abstract

Nowadays, corporate social responsibility (CSR) has a significant role in the airline industry. The purpose of the present paper is to prioritize the factors influencing CSR in the airline industry. The present study prioritizes the factors influencing CSR in Iran's airline industry by using criteria importance through inter-criteria correlation (CRITIC) and Complex proportional assessment (COPRAS) to find the best airline among five Iranian airlines in Iran in 2021. Factors influencing this study include 4 main criteria and 15 sub-criteria. The results show that energy consumption is the most influential factor among influence factors, and airline 3 obtained the first rank. The present study helps airline managers to improve the performance of CSR by influencing factors in the airline industry.

### Keywords:

CSR  
airline industry  
Iran  
CRITIC  
COPRAS

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## INTRODUCTION

CSR is the continuing commitment by businesses to behave ethically and contribute to economic development while enhancing the quality of life of the workforce and their families as well as of the local community (Mukherjee, et al., 2018). CSR has become a significantly important part of the functioning of large companies, especially given the context of their relationship with the local community (Wozniak & Jurczyk, 2020).

CSR has attracted increased attention from academics and practitioners in recent decades. The concept of CSR implies a willingness on the part of businesses to find and exercise obligations besides those of a commercial nature, encompassing socio-cultural and environmental considerations (Ghaderi et al., 2019). CSR is a significant factor in corporate management activities. Many research explored its effects on the outcomes of corporations engaged in services on consumer perceptions. This shows that the effects of CSR on customer attitudes and perspectives have become one of the best research topics. Of the various aspects of customer attitude and perspectives, perceived corporate reputation is one of the most important antecedents for firm success in competitive markets (Park, 2019).

CSR encompasses the external communication tools instrumentally utilized by a company to inform stakeholders about environmental and social initiatives (Colucci et al., 2020) like CSR reports, corporate websites, advertising, and product labeling. Among the main CSR communication tools, CSR reports are becoming popular (Tschopp & Huefner, 2015). Nowadays, companies have developed standalone CSR reports. Websites also serve as important CSR communication tools; in particular, they enable small companies to inexpensively disclose their CSR commitments (Colucci et al., 2020). The adoption of CSR principles is useful for companies to acknowledge their responsibilities and account for their impacts on stakeholders. The social CSR and environmental CSR domains focus on the direct interactions between a

company and the environment. On the other hand, the CSR domain accounts for the development of customer relationships via data exchanges and the outcomes of a company's actual behavior via the ability to influence stakeholders' cognition (Contini, et al., 2020).

Today, safe means of transport and traveling have become a necessity. People have always considered safety as a significant part of their lives and flying is the safest way to travel, so this is why many people opt for air travel as their best choice (Majidi et al., 2014). The airline industry is fundamental to transport and providing different benefits to the travel industry, and community, such as job creation, volunteering activities, or investment in facilities for destitute and neglected individuals (Su et al., 2017). With important growth in the airline industry, companies in the airline industry have been required to reduce their negative effects, and improve their positive effects on the community. This trend has improved CSR activities by the airline (Chen et al., 2012). The academic and industry literature indicates that a large number of airline companies are starting to conduct CSR activities and promote them to the public, including their customers (Hooper & Greenall, 2005).

The present research aims to employ a framework to investigate in Iran airlines industry are including Iran Air, Aseman Air, Kish Air, Qeshm Air, and Iran Airtoure to identify the best factors of CSR to contribute to the best performance of airlines by Multi-Criteria Decision Making (MCDM) methods CRITIC and COPRAS methods. Concerning the fact that airlines are among the most important center of air pollution, so present research identified and employed CSR factors in Iranian airlines. The innovation of the present study lies in the fact that today governments, companies, and people pay more attention to the environment and they try to reduce negative effects like greenhouse gasses in the world and improve the advantage of a company. Also, another innovation is, that no studies have been conducted on the roles of CSR in the airline industry in Iran. The remainder of this paper is organized as follows: Section 2 provides a review

of relevant literature, research background, and influential factors. Research methodology is provided in section 3. Section 4 presents research findings, and finally, section 5 is a discussion and conclusion.

## LITERATURE

### Corporate social responsibility (CSR)

Today, Pressure to engage with social and environmental concerns is progressively shaping the nature and content of multinational investment communications. In emerging economies, CSR has been gaining improving regard. In advanced economies, the attitudes of investors, concerns of regulators, the media, and other stakeholders, are significant determinants of CSR (Aray et al., 2021).

CSR has recently attracted more notice in economics, so a wide part of the study on CSR practices exists, recently. CSR improves competition in the airline industry and discussed the economic effects of CSR on the industry. CSR will not necessarily bring the company negative points showed that CSR practices enhance private benefit maximization companies (Chen et al., 2019). While economic growth has been extensive, the ecological side of the airline industry has been ignored (Arjomandi et al., 2018). CSR requires organizations to question the expense to which their internal practices and stakeholders adhere, and deliver on, the principles of sustainable development (Coles et al., 2014). Reviews found that until 2000, the focus of CSR was on environmental issues, that later expanded to include customers and employees. Although some studies utilized an aggregate measure of CSR, later study has focused on specific components, such as employment, philanthropy, or diversity, and its impact on performance (Rhou & Singal, 2020).

CSR activity, corporate practices that arguably improve societal well-being, has gained large momentum in the last few decades. It is indicative that U.S. firms that prioritize CSR in their investment decisions managed about \$9 trillion in assets in 2015. Moreover, an increasing number of companies have started incorporating CSR reporting as a key part of company strategy. The practice has attracted important academic interest

and it has been interpreted as an administrative tool that contributes to securing broader stakeholder support (Chantziaras et al., 2020). CSR investment as a global event has remained a thriving corporate governance concept and management strategy in most multinationals. It keeps attracting the interest of a vast number of scholars, economists, governmental and non-governmental organizations, and the public as a result of the industrial growth and economic prosperity of many nations. Documented evidence has shown that investments in CSR have the potential of making positive contributions to the development of the community. In effect, most companies are starting to see the benefits of setting up strategic CSR agenda (Oyewumi et al., 2018).

CSR organizational activities and policies that take into account stakeholders' expectations and the triple bottom line of economic, social, and environmental performance have become a real practice, and all companies embrace CSR initiatives in their annual planning. CSR covers a large number of a different view and issues like a social contract, business ethics, corporate citizenship, and environmental sustainability. CSR contributes to sustainable development by working to extend the quality of life of employees, and their families (John, et al., 2019). Researchers have argued that CSR must relate to comprehensive business transformation, in which CSR becomes part of a firm's overall value proposition. Corporate social responsibility can strengthen a company's sustainable image and its brand that is why CSR can be considered a viable competitive advantage. CSR initiatives, like certifications, might in their simplest form be ways of attracting investors who themselves are obliged to show proof of sustainability. However, an ambitious CSR agenda includes extending community and the environment (Dahlin et al., 2020). In one study by Cai et al (2019) CSR disclosure reduces the information disadvantage of foreign investors and facilitates cross-border investment. Chen et al (2019) showed findings suggest that the growing CSR demand in the supply chain is in line with the interests of shareholders and stakeholders. Bird et al (2007)

found that socially responsible and irresponsible activities, as well as the sum of all CSR activities, have significant impacts on performance. Ting (2020) showed that firm size positively affects firms' CSR disclosure, and CSR disclosure has a positive impact on firm financial performance, and the positive effect is stronger for small firms that have fewer employees. Peters and Mullen (2009) found that the effect of CSR on firm performance is positive and gets strengthened over time, supporting that CSR is beneficial for both shareholders and stakeholders.

According to the European Commission (EC) definition, CSR is a concept whereby companies integrate social and environmental concerns in their business and their interactions with their stakeholders on a voluntary foundation, while the World Business Council on Sustainable Development views CSR as the continuing commitment by business to behave ethically and contribute to economic development while enhancing the quality of their life, and their families, as well as their local community (Coles et al., 2014). The World Business Council on Sustainable Development (WBCSD) (2000) defines CSR as the commitment of business to contribute to sustainable economic extension, working with employees, their families, the local community to enhance their quality of life. Although there has been some limited concerns in the past, that CSR attracted important interest. For instance, government leaders called for greater "corporate environmental and social responsibility and accountability" in the Johannesburg Declaration (Tsai & Hsu, 2008).

With governments' increasing awareness of the value of CSR reports, many governments now require CSR disclosures regarding social aspects. This type of information includes companies' economic, legal, ethical, and philanthropic responsibilities towards the community in general, and their range of stakeholders in particular. Evidence that includes this information is referred to as CSR, sustainability, corporate responsibility, and triple bottom line reports, without significant differences among these terms. Companies consider CSR a significant tool to manage external appearances and control their

reputation among customers, employees, and others, which affects their legitimacy (Hughey & Sulkowski, 2012). CSR annual report is a useful technique for enhancing a company's relationship with stakeholders, as many investors, environmental teams, and governments have primarily relied on the annual report to obtain companies' financial and non-financial information (Kuo, et al., 2016). In one study Mohamed Adnan et al (2018) showed that national culture is associated with resistance to reporting CSR, but that corporate governance can help to mitigate the influence of national culture. Peters and Mullen (2009) found that the effect of CSR on firm performance is positive and gets strengthened over time, supporting that CSR is beneficial for both shareholders and stakeholders. Choi and La (2013) indicated that perceived CSR has an important impact on customer trust and loyalty and that customer trust work as a key mediating variable in service improvement.

#### **Airline industry**

The CSR in the travel, tourism, and hospitality industry has improved recently because of its close reliance on sociocultural and environment and its peaking interest in sustainability. CSR initiatives can not only be sources of innovation and positive points, but they also grow the destination's total effort to arrive at sustainability (Nidumolu et al., 2009). Air transportation is one of the sections that significantly contribute to socio-economic development as well as to the growth of living standards (Kalemba & Campa-Planas, 2017).

Air transport is one of the industries that benefit from globalization. In 2013, the air traffic shows a 5.2% growth in passengers with the annual increase rate of the past 30 years. The International Air Transport Association (IATA) has forecasted a 4.1% average annual increase in demand for air connectivity until 2034 (Ivaldi & Toru-Delibasi, 2018). In the last 20 years, awareness of the environmental impacts of human activity has improved seriously. There is a growing public expectation that companies should recognize their social and environmental responsibilities toward the community and control their business operations to enhance the

sustainability of their activities (Juholin, 2004; McIntosh et al., 2003). Attention is being paid to the tourism industry, which has economic and social benefits to destinations and can also have big disadvantage economic, social and environmental impacts. Given the forecasts of important future development in tourism volume, there is growing pressure on tourism companies to implement sustainability initiatives. Within the tourism industry, the airline portion is receiving significant attention, from both the general and the academia, because of its role in tourism extension and its so important environmental and social impacts, so there is a growing interest in the area and effectiveness of efforts undertaken by airlines to mitigate their negative impacts and to contribute to sustainable development (Cowper-Smith & de Grosbois, 2011).

Air travel delivers social and economic interests through tourism, business travel, and the sharing of knowledge and experiences. It provides facilitates the transportation of tourists to destinations around the world, which can contribute to poverty alleviation in developing countries (Air Transport Action Group [ATAG], 2008). In remote areas, other transportation is generally unavailable, and air travel acts as the only public transport facilitating access to these destinations (ATAG, 2008; International Labour Organization, 2003). In recent years, the majority number of private airlines has increased, low-cost transport has been successful, and an increasing number of airlines have worked in international business. (Wanke et al., 2015). Airlines are devoted to enhancing their useable performance and pursuing greater competitiveness. Universities are aware of the necessity for convenient airline performance evaluations and have studied this topic. Also to increase desirable outputs which were highlighted in operational management, the undesirable outputs such as flight delays and CO<sub>2</sub> emissions of airlines should further be reduced, to continually improve their productivity (Huang et al., 2020).

Seo et al (2015) finding suggested that although improving service quality is crucial, the improvement does not always increase firm performance when integrated with CSR activities

and provides important implications for airline firms, suggesting efforts toward the development and implementation of a strategy that can optimize competitive advantages. In the study of Zou et al (2014) into 15 US airlines, disparities were found in the fuel efficiencies of airlines. The least efficient airlines were 25-42 percent less efficient than the most efficient airlines. Mallikarjun (2015) showed that national US airlines were less efficient than major airlines in controlling expenses and gaining operating revenue in 2012.

Airlines have one of the greatest stakeholder groups compared to other industries. In the global situation, 54 percent of international tourists travel by air, and the industry supports 62.7 million jobs and contributes 3.5 percent to the global GDP in the world. The airline industry creates negative environmental impacts, such as carbon emissions, noise pollution, and waste generation Airline's output produces around 2 percent of human carbon emissions of over 36 billion tonnes, and this is expected to rise by over threefold in the period to 2050. Airlines also produce nitrogen oxides and other non-carbon materials, such as noise and waste that affect air quality and the climate. (Upadhaya et al., 2018). Contini et al (2020) showed CSR activities aimed at reducing the impact of a company's work on local communities have the highest importance for consumers compared to CSR activities that ensure reliable communications and prevent environmental impacts.

### **CSR In airline industry**

The airline industry is a part of the service portion which plays a significant role in the tourism and transportation industry. These days, the airline industry is operating in a competitive situation. CSR is the source of competitive advantages. CSR contributes to the long-term value of an airline (Chang et al., 2015). Inoue and Lee (2011) showed that the findings can provide tourism managers with insights into which dimensions of CSR activities would improve their companies' financial performance. In one study, Kuo et al (2021), showed that airlines should prioritize the selection of key performance indicators for the implementation of CSR toward

sustainability. The airline industry undoubtedly has negative environmental impacts, such as climate change because of CO<sub>2</sub> and other greenhouse gas emissions from high fuel consumption, water pollution, waste and noise production, and loss of biodiversity. Such negative environmental impacts of airline actions have brought about social pressures on environmental sustainability, pushing the industry toward CSR actions. CSR is well described in the mission statement of many airline companies. (Lee et al., 2018).

Airports need to balance profits and social impacts on their stakeholder including residents, airlines, and travelers. To enhance competitive positive points and ensure sustainable development, airports should take on the mission of community feedback such as environmental protection, economical value creation, and social caring. Therefore, it has become commonplace for airports to implement CSR activities for meeting their stakeholders' expectations (Chang & Yeh, 2016). CSR refers to context-specific organizational policies that take into account stakeholders' expectations and the triple bottom line of economic, social, and environmental performance, enabling the airline to improve its business performance. Airline passengers are the outside stakeholders of the company and their favorable perceptions of CSR works contribute to value performance and passengers' loyalty (Ilkhanizadeh & Karatepe, 2017). Flight attendants as the internal stakeholders have strong interactions with passengers and spend their time handling passenger problems. (Karatepe & Talebzadeh, 2016). When flight attendants have a favorable conception of CSR actions, they share them with passengers and improve the organizational actions. CSR also helps customers' choice of company and positive financial performance (Aguinis & Glavas, 2012).

At the present, the airline industry is a significant section of the tourism industry that deserves further study about CSR (Inoue & Lee, 2011). The airline industry is receiving considerable attention in many parts of the world. Along with the fast development of the global economy, every year, airline passenger traffic is

growing. This means that the airline industry strongly becomes a major transport service portion (Low & Lee, 2014). In today's competitive environment of the airline industry, CSR behaviors can help airlines enhance their competitive benefit and acquire customer loyalty. Also, the majority of airlines are attempting to improve their public image through CSR operations. Meanwhile, the actions of airlines can create job opportunities and economic interests but can produce some negative effects, such as climate change, air pollution, etc. Therefore, airlines are required to implement CSR to decrease their negative effects while maintaining or increasing their positive effects (Wang et al., 2015). In one study Wang et al (2014) showed that most of the larger state-controlled airlines perform better in the performance of CSR, and the private airline has made a relatively large improvement in their CSR performance. Chen et al (2012) showed when relationship quality is controlled for, airline social responsibility has a marginally significant and positive association with behavioral and attitudinal loyalty. Lee and Park (2010) showed that the findings can provide airline corporate executives with practical knowledge with which to strategically develop better business plans that incorporate CSR activities.

Air transport certainly reasons fundamental environmental and social impacts. The airline industry has been under increasing pressure to undertake initiatives to decrease its negative effects. As a result, an increasing number of airlines have implemented CSR initiatives. When an airline invests resources in activities related to social responsibility and sees such investment as a section of the promotion and marketing of the company (Valor, 2005). CSR has become a central concern for senior executives and companies have allocated the most skills to CSR (Zolotoy et al., 2019). Therefore, airline managers want to know the likely impact of customer knowledge and views of CSR, and how it affects the relationship between customers and airlines (Chen et al., 2012). The successful performance of a universal CSR strategy requires many resources and changes in the company, whether

cross-functional collaboration or basic thinking on work. The airline industry plays a significant role in the tourism section, thus encouraging the airline industry to live up to the high expectations in the notice to CSR actions (Chang et al., 2015). Nikbin et al., (2016) highlighted the important role of CSR in-service failure situations and has significant implications for airline managers. Ilkhanizadeh and Karatepe (2017) showed the results have important implications for flight attendants' perceptions of corporate social responsibility practices and the aforesaid outcomes.

Table 1: Criteria and sub-criteria influencing CSR of airline industry (Karaman and Akman, 2018)

Criteria	Sub-criteria	Definition	References
Economic C1	Corporate governance and business ethics C11	Anti-corruption and anti-bribery policies; Transparency	Chang et al., 2015; Ilkhanizadeh and Karatepe, 2017; Tsai and Hsu, 2008
	Enterprise performance and future C12	Improve company efficiency, innovation, financial performance	Wang et al., 2015; Chen et al., 2019
	Product and services C13	Product quality; Product technology; Life-cycle management	Coles et al., 2014; Ilkhanizadeh and Karatepe, 2017; Wang et al., 2015; Inoue and Lee, 2011; Chang and Yeh, 2016
	Responsible sourcing C14	Purchasing practices and long-term collaborative relationships	Karaman and Akman, 2018; Chang et al., 2015; Lynes and Andrachuk, 2008
	Emission Reduction/Air Pollution C21	Reducing fuel consumption; Introducing new fuel-efficient aircraft; Using alternative fuels; Introducing latest technology engines; CO2 emissions	Chang et al., 2015; Chen et al., 2012; Cowper-Smith and de Grosbois, 2011; Tsai and Hsu, 2008; Inoue and Lee, 2011; Huang et al., 2020
Environment C2	Energy Consumption C22	Reducing energy use in offices; using renewable energy	Chang et al., 2015; Chen et al., 2012; Cowper-Smith and de Grosbois, 2011; Rhou and Singal, 2020; Tsai and Hsu, 2008; Inoue and Lee, 2011
	Waste Management C23	reusing and recycling waste	Cowper-Smith and de Grosbois, 2011; Karaman and Akman, 2018; Inoue and Lee, 2011
	Water Use and Pollution S24	Reducing water consumption; Reducing water pollution	Cowper-Smith and de Grosbois, 2011; Rhou and Singal, 2020
	Noise Reduction C25	Using new operational procedures such as continuous descent; Introducing quieter aircraft	Chang et al., 2015; Karaman and Akman, 2018; Cowper-Smith and de Grosbois, 2011
	Biodiversity C26	Ensuring ecological integrity; Involving in environmental conservation projects	Cowper-Smith and de Grosbois, 2011; Karaman and Akman, 2018
	Systematic Efforts C27	Obtaining ISO 14001; Contributing scientific research projects	Cowper-Smith and de Grosbois, 2011; Karaman and Akman, 2018

Social C3	Employee wellbeing and engagement C31	safety, and wellbeing.Improving employee health, Increasing employee involvement in environmental	Chen et al., 2012; Coles et al., 2014; Cowper-Smith and de Grosbois, 2011; Lynes and Andrachuk, 2008; Tsai and Hsu, 2008; Wang et al., 2015
	Diversity and social Equity C32	Increase diversity in the workforce; Universal accessibility for customers and employers	Cowper-Smith and de Grosbois, 2011; Ilkhanizadeh and Karatepe, 2017; Lynes and Andrachuk, 2008; Chen et al., 2012; Coles et al., 2014; Cowper-Smith and de Grosbois, 2011; Ilkhanizadeh and Karatepe, 2017; Tsai and Hsu, 2008; Wang et al., 2015
	Community Wellbeing C33	Involving in projects; Raising customer awareness of sustainable development issues	Cowper-Smith and de Grosbois, 2011; Wang et al., 2015; Park, 2019
	Economic prosperity C34	Economic prosperity Sustainable preparation practices; Job creation; Contributing to local economic development	

### Iran airline industry and CSR

The airline industry is so significant for the movement of passengers and freight around the world. It is a very dynamic industry, and over the last 40 years has undergone several structural changes requiring important arrangements for business and ensuring sustainability. (Arjomandi et al., 2018).

CSR has become a part of growing benefits for business organizations in this time (Jamali et al., 2017; Carroll & Shabana, 2010). CSR is promoted by different governments, and non-government organizations (NGOs).

Separate from these constituents, transnational organizations, such as the United Nations, the International Labor Organization, the International Organization for Standardization, the Organization for Economic Co-operation and Development (OECD), and the World Bank not only endorse CSR but have also created guidelines to increase CSR. (Lee, 2008). There are very international efforts to accelerate CSR adoption and create standards for its implementation. At the international level, the United Nations Global Compact is a voluntary initiative based on 10 principles for responsible corporate behavior in the areas of human rights, labor relations, anti-corruption, and the environment. At the present time, more than 1,500 companies in 130 countries are section of this Compact. Cultures change in their interpretation and adoption of CSR although, in plenty of countries, environmental degradation and climate change are driving CSR. Cultural and religious

customs often underlie the business community's ethics, implying different areas of acceptance and usage of CSR. Countries' perceptions of CSR also vary based on their political and institutional environments (Sheldon and Park, 2011). In one study Vourvachis et al (2016) found that for three phenomena the organizations become to have responded with considerable increases in CSR disclosure that are consistent with attempts of legitimation. Qu (2007) found that regulations affecting CSR activities between the U.S. and Chinese companies differ significantly. One study by Gloßner (2019) found CSR is in the interests of long-term investors if CSR prevents events. Chu et al (2020) showed the influence of attitudes toward CSR in social media on consumers' engagement with CSR communication in social media is stronger for the Chinese participants than for the U.S contributors.

The lack of notice of the commercial operations of the airline industry has led the industry to be faced with a multitude of problems. The current problems of Iran's airline industry are not just due to sanctions most of these problems are internal and thus, internal problems that lead to underdevelopment must be first solved (Omidia & Khoshtinata, 2017). Iran Civil Aviation Organization (CAO) is established in 1946 and is responsible for applying rules to air transport, controlling airport performance, and safe flights. This governmental organization became a member of the International Civil Aviation Organization (ICAO) in 1949. "Iranian Airways" was the first indoor airline, which started to work in 1946. Persian Airways was another private airline that was established in 1954 for transporting cargo to Europe. Several factors such as Iran's geographical situation, people's welfare, and requirements of having a relationship with other countries caused the government to establish a national airline. In 1962 "Iranian Airways" and "Persian Airways" were merged and "Iranian national airline" was established which was known as "Iran Air", internationally. Developments in technology and communities caused civil air transport to extend and allow private airlines to start their work. Now, 16 local

airlines are active in Iran. (Omrani & Soltanzadeh, 2016; Ahang et al., 2016).

Now, after seven decades of the establishment of the airline industry in Iran, around 16 public and private airlines are active in the country, which indicates the potential of its passenger and cargo market. United States sanctions against Iran have had many harmful impacts on the airline industry, and have caused its passenger and cargo fleet, which was one of the largest air fleets in Asia and the Middle East in the 1960s, to become unable to modernize itself (Ahang et al., 2016). The Iranian airline industry is facing different problems and the strategic solution for these problems has rarely been noticed. The airline industry lacks a clear strategic and flexible policy, productivity, and a balance between consumption and income (Nejati et al., 2009), but with all these problems Iranian airlines are standing and problems are not able to stop it from progressing. Although Iran's airline industry has some problems like sanctions, CSR has creative in Iranian airlines. The Iranian government and airlines managers know that CSR programs are useful for their development as they can enhance their country's economic and social situation and also consider the environmental situation as when an industry such airline industry does not respect nature. it has many environmental problems for the country. Although CSR consider in Iran airlines and they always try to have CSR in this industry, it should be more than it as CSR can improve society and maintain a great balance between the economy of society and the ecosystem. In this study, we will show which factors of CSR are useful for this area because about roles of CSR in Iranian airlines are not any articles and references so this study would be useful.

## METHODOLOGY

This research aims to prioritize factors influencing CSR of the Iranian airline industry by CRITIC and COPRAS to prioritize 5 Iran airlines. The present study is applied research in terms of purpose. From the perspective of the data collection method and period, it is also a survey cross-sectional research. The research employed a decision matrix questionnaire was used to collect the data. The data was collected from the airline



industry in Iran in 2021. 15 experts participated in this study. All participants held high education certificates in the airline industry, had manager experience in Iran airlines, and work more than 20 years in this industry.

**CRITIC method**

The CRITIC method was proposed by D. Diakoulaki which aims at the determination of objective weights of relative importance in multiple criteria decision method (MCDM) problems. The weights derived incorporate both contrast intensity and conflict that are contained in the structure of the decision problem. The method developed is based on the analytical investigation of the evaluation matrix for extracting all data contained in the evaluation criteria. The study shows that the CRITIC method can get better objective weights among MCDM methods (Diakoulaki et al., 1995; Wang & Zhao, 2016; Miao et al., 2018).

For a finite set  $A$  of  $n$  alternatives and given system of  $m$  evaluation criteria  $f_j$ , the multi-criteria problem in its general form can be defined as follow:

$$Max \{f_1(a), f_2(a) \dots, f_m(a) / a \in A \} \quad (1)$$

**Step 1:** For every criterion  $f_j$  of this multi criteria problem we define a membership function  $x_j$  mapping the values of  $f_j$  to the interval  $[0, 1]$ . This transformation is based on the concept of the ideal point. So, the value  $x_{aj}$  below, expresses the degree to which the alternative  $a$  is close to the ideal value  $f_j^*$ , which is the best performance in criterion  $j$ , and far from the anti-ideal value  $f_j^*$ , which is the worst performance in criterion  $j$ . Both  $f_j^*$  and,  $f_j^*$  are achieved by at least one of the alternatives under consideration.

$$x_{aj} = \frac{f_j(a) - f_j^*}{f_j^* - f_j^*} \quad (2)$$

**Step 2:** Each vector  $x_j$  is characterized by the standard deviation,  $\sigma_j$  which quantifies the contrast intensity of the corresponding criterion. So, the standard deviation of  $x_j$  is a measure of

the value of that criterion to the decision making process. It is clear that any other index of the divergence in scores and could be used instead of the standard deviation.

**Step 3:** a symmetric matrix is constructed, with dimension  $m \times m$  and a generic element  $r_{jk}$ , which is the linear correlation coefficient between the vectors  $x_j$  and  $x_k$ . It can be seen that the more discordant the scores of the alternatives in criteria  $j$  and  $k$ , the lower the value  $r_{jk}$ .

**Step 4:** this step measure the conflict of criteria.

$$\sum_{k=1}^m (1 - r_{jk}) \quad (3)$$

**Step 5:** This method is based in both contrast intensity and conflict of decision criteria, so compose them as Equation 2 shows:

$$(4) C_j = \sigma_j \cdot \sum_{k=1}^m (1 - r_{jk})$$

**Step 6:** Normalize the value of information transmitted by each criterion:

$$w_j = \frac{C_j}{\sum_{k=1}^m C_k} \quad (5)$$

**COPRAS method**

The COPRAS method introduced by Zavadskas et al (1994) is an MCDM method. Suppose that we have a decision making problem consisting of  $m$  alternatives that must be evaluated based on  $n$  criteria and  $x_{ij}$  is the value of the  $i^{th}$  alternative in the  $j^{th}$  criterion. The algorithm of the COPRAS method consists of the steps introduced below (Kaklauskas & Zavadskas, 2011; Yücenur et al., 2020)

**Step 1:** Select the available set of the most important attributes describing the alternatives.

**Step 2:** Prepare decision-making matrix  $X$ :

$$x = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \quad (6)$$

**Step 3:** Normalization of this matrix using the following equation:

$$(7) \bar{x}_{ij} = \frac{x_{ij}}{\sum_{i=1}^m x_{ij}}$$

Where  $\bar{x}_{ij}$  denotes the normalized value of the  $j$  –  $th$  criterion;  $x_{ij}$  is the  $i$  –  $th$  alternative performance of the  $j$  –  $th$  criterion; and  $m$  is the alternative numbers.

**Step 4:** Compute the normalized weighted matrix using an equation as below:

$$d_{ij} = w_j \times \bar{x}_{ij}, \quad (8)$$

Where  $\bar{x}_{ij}$  is the efficiency of the  $i$  –  $th$  alternative and  $w_j$  is the criterion weight.

**Step 5:** For useful criteria, ( $S_{i+}$ ) is the sum of the values in the weighted normalized decision matrix and ( $S_{i-}$ ) is the sum of the values in the weighted normalized decision matrix for the useless criteria. The calculation steps of the ( $S_{i+}$ ) and ( $S_{i-}$ ) values are as follows in equation.

$$S_{i+} = \sum_{j=1}^k d_{ij}, \quad j = 1, 2, \dots, k \quad (9)$$

$$S_{i-} = \sum_{j=(k+1)}^n d_{ij}, \quad j = k + 1, k + 2, \dots, n \quad (10)$$

**Step 6:** Estimate the final weights using the following equation:

$$Q_j = S_j^+ + \frac{S_{min} \cdot \sum_{j=1}^n S_j^-}{S_j^- \cdot \sum_{j=1}^n S_{min}^-} \quad (11)$$

**Step 7:** The alternative with the highest relative importance value among the other will be chosen as the best.

$$Q_{max} = \max_i \{Q_i\}, i = 1, 2, \dots, m \quad (12)$$

**Step 8:** Calculate the utility degree of each alternative. Where  $Q_i$  and  $Q_{max}$  – the weights of the projects obtain.

$$N_i = (Q_i / Q_{max}) 100\% \quad (13)$$

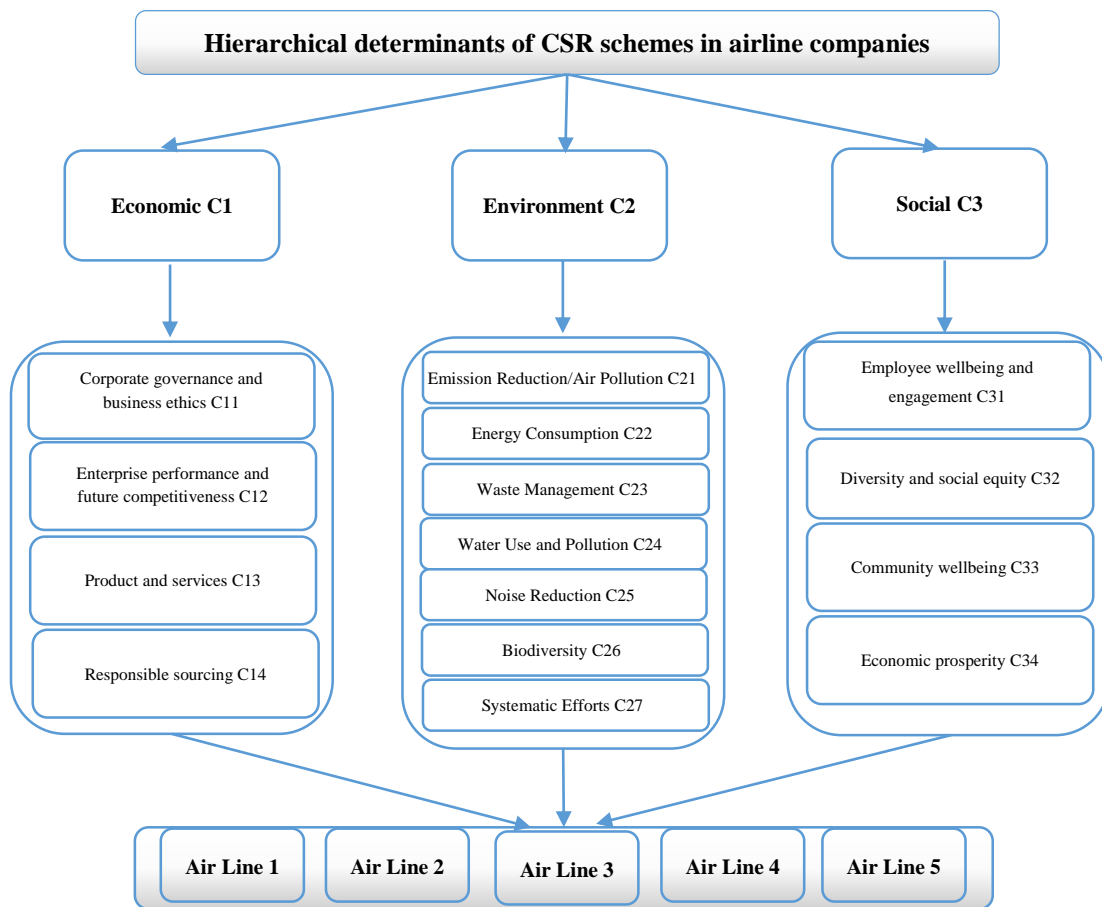


Fig. 1. Hierarchy structure for evaluating factors influencing CSR in airline industry

**FINDING**

In this case study, five airlines were studied based on fifteen CSR factors. A hybrid CRITIC-COPRAS method was used to prioritize the airlines. In both methods, first, a decision matrix should be formed, and in the second step, the

matrix evaluates the airlines based on all factors and assigns scores to them. This matrix is the benchmark for performance evaluation of airlines in which performance factors and airlines are respectively represented by and as shown in Table 2 so that they can easily be tracked and studied.

Table 2: CSR performance decision matrix for airline industry

X	C11	C12	C13	C14	C21	C22	C23	C24	C25	C26	C27	C31	C32	C33	C34
A1	2.47	3.33	1.93	2.47	6.80	6.40	4.87	6.07	3.00	4.20	3.47	2.67	2.67	4.00	2.67
A2	3.00	3.53	2.47	2.33	7.33	6.33	5.33	6.07	2.47	3.93	3.07	2.40	2.40	3.60	2.67
A3	2.80	4.27	3.40	2.53	8.33	6.93	4.87	6.60	3.73	3.73	3.67	2.73	3.20	4.73	2.93
A4	3.20	3.80	2.27	2.47	6.87	6.33	5.67	6.50	2.80	3.27	3.60	2.73	2.00	3.27	2.53
A5	2.93	3.07	1.87	1.80	7.20	6.33	5.67	6.53	2.73	3.73	3.20	3.20	2.47	3.47	2.27

It should be noted that in the COPRAS method, computation of decision factors weights is needed to prioritize alternatives. CRITIC method was used to determine factor weights. In the CRITIC

method, decision matrix values are used as criteria for determining factor weights. The correlation matrix in the CRITIC method is perfectly shown in Table 3.

Table 3: Correlation matrix in CRITIC method

R	C11	C12	C13	C14	C21	C22	C23	C24	C25	C26	C27	C31	C32	C33	C34
A1	0.00	0.22	0.04	0.91	0.00	0.11	0.00	0.00	0.42	1.00	0.67	0.33	0.56	0.50	0.60
A2	0.73	0.39	0.39	0.73	0.35	0.00	0.58	0.00	0.00	0.71	0.00	0.00	0.33	0.23	0.60
A3	0.45	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.50	1.00	0.42	1.00	1.00	1.00
A4	1.00	0.61	0.26	0.91	0.04	0.00	1.00	0.81	0.26	0.00	0.89	0.42	0.00	0.00	0.40
A5	0.64	0.00	0.00	0.00	0.26	0.00	1.00	0.88	0.21	0.50	0.22	1.00	0.39	0.14	0.00

In this step, the primary weights of criteria,  $C_j$ , should be obtained in a linear way using CRITIC

method. Standard deviations are shown in Table 4.

Table 4: Standard deviations

$\sigma_j$	0.372	0.383	0.402	0.409	0.402	0.437	0.501	0.495	0.378	0.366	0.430	0.360	0.365	0.395	0.363
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At last, the final weights should be obtained for the factors which are according to Table 5. As seen in the table, each factor influencing the airline industry is ranked based on its importance. Given Table 5, relevant experts ranked Energy Consumption as the most important CSR factor showing its high importance compared to other factors and this warrants more attention from government and airline management to this factor. The second rank belonged to the Emission Reduction/Air Pollution factor among CSR factors influencing the Iranian airline industry and

this shows the focus of relevant experts on this factor as an effective one. According to the experts' opinions, the factors Product and Services and Community Wellbeing were respectively ranked third and fourth among all studied factors and should be paid appropriate attention. Also, the factors Corporate Governance and Business Ethics and Responsible Sourcing were ranked fourteenth and fifteenth respectively showing their low importance compared to other factors in experts' opinions and turn their low impact in the present study.

Table 5: Final prioritization of CSR decision factors in airline industry using CRITIC method

Criteria	Symbol	Weight	Rank
Corporate Governance and Business Ethics	C11	0.05	14
Enterprise Performance and Future Competitiveness	C12	0.065	8
Product and Services	C13	0.082	3
Responsible Sourcing	C14	0.036	15
Emission Reduction/Air Pollution	C21	0.082	2
Energy Consumption	C22	0.104	1
Waste Management	C23	0.074	5
Water Use and Pollution	C24	0.07	7
Noise Reduction	C25	0.072	6
Biodiversity	C26	0.051	13
Systematic Efforts	C27	0.059	11
Employee Wellbeing and Engagement	C31	0.063	9
Diversity and Social Equity	C32	0.061	10
Community Wellbeing	C33	0.076	4
Economic Prosperity	C34	0.054	12

The first step in solving problems using the COPRAS method includes the formation of a decision matrix. Then, the weighted normalized decision matrix should be computed. In the next step, weights are determined which are

represented with. Therefore, the weighted normalized decision matrix is shown in Table 6 based on the calculated weights.

Table 6: Weighted normalized decision matrix

V	C11	C12	C13	C14	C21	C22	C23	C24	C25	C26	C27	C31	C32	C33	C34
Airline1	0.009	0.012	0.013	0.008	0.015	0.021	0.014	0.013	0.015	0.011	0.012	0.012	0.013	0.016	0.011
Airline2	0.010	0.013	0.017	0.007	0.017	0.020	0.015	0.013	0.012	0.011	0.011	0.011	0.011	0.014	0.011
Airline3	0.010	0.015	0.023	0.008	0.019	0.022	0.014	0.015	0.018	0.010	0.013	0.012	0.015	0.019	0.012
Airline4	0.011	0.014	0.016	0.008	0.016	0.020	0.016	0.014	0.014	0.009	0.012	0.012	0.010	0.013	0.010
Airline5	0.010	0.011	0.013	0.006	0.016	0.020	0.016	0.014	0.013	0.010	0.011	0.015	0.012	0.014	0.009

In the next step, the best alternative should be selected. For each alternative, sum of  $d_{ij}^-$  and  $d_{ij}^+$  values should be calculated. It means that sum of negative factor values and sum of positive factor values should be calculated separately for each alternative. The higher the  $d_{ij}^+$  value and the lower the  $d_{ij}^-$  value, the better the related alternative. Then the sum total is calculated and in the next

step the best alternative is selected. Finally, the values are normalized using (8). In the above relation, ( $Q_{max}$ ) is the maximum value of relative importance and Utility values of alternatives are always between 0% and 100%. A summary of results is shown in Table 7.

Table 7: Prioritization of airlines using COPRAS method

Airlines	s+	s-	Qj	Nj	Priority
Airline 1	0.195	0.011	0.211	78%	3
Airline 2	0.236	0.011	0.252	93%	2
Airline 3	0.254	0.010	0.270	100%	1
Airline 4	0.193	0.009	0.209	77%	4
Airline 5	0.191	0.010	0.207	77%	5

According to Table 7, five Iranian airlines were studied and ranked concerning CSR factors. Based on experts' opinions, Airline 3 ranked first among the studied airlines showing greater importance of CSR factors to managers of this airline. Airline 2 ranked second among the studied airlines showing its favorable CSR performance. Airline 5 ranked fifth according to the experts' opinions and this finding showed that CSR factors were not appropriately emphasized and paid due attention by this airline's management.



Fig. 2. Airline prioritization using COPRAS method

## DISCUSSION AND CONCLUSIONS

The airline industry is an important industry for transportation everywhere, so CSR programs are necessary for this industry. The aim of this study is to evaluate the influence factors of CSR to help airlines to have the best performance. The present study utilized the CRITIC method to rank factors that influence CSR in the airline industry and prioritize 5 Iranian airlines by the COPRAS method. Among 15 sub-criterion, energy consumption with the weight of 0.105 is the highest influence factor among others. Emission reduction/ air pollution factor with a weight of 0.082 obtained the second rank among 15 factors. Product and Services with the weight of 0.082 obtained the third rank and Community Wellbeing and Waste Management factors were respectively ranked fourth and fifth ranks. Responsible sourcing factor with a weight of 0.036 the lowest rank among influence factors of CSR.

With improvement in living standards and a decline in the cost of air transportation, the request for airline services has increased steadily. The airline industry consumes a lot of energy, so increasing demand for air transportation will lead to more energy useable and carbon emissions. In

the past ten years, the annual growth rate of fuel consumption in the airline industry is rather than 6%, and the CO<sub>2</sub> emissions of the airline industry account for approximately 2% of global CO<sub>2</sub> emissions in 2015. This proportion is estimated to grow to 2.4%–4.1% by 2050 (Zhang et al., 2017). The airline industry has been threatened by global tension throughout history. From the oil sanction, airline deregulation, and terrorist attacks, the industry has weathered a majority number of storms. The survival of an airline during and after these downturns is frequently related to the airline's business. (Sobieralski, 2020).

Currently, fossil fuels fulfill a predominant portion of the required energy for the communities. However, devastating impacts due to their usage such as global warming, environmental pollution, and rise in sea levels are generally well-understood. As energy and environment issues are getting more notice, clean energy resources such as renewable energies (REs) have been getting more interesting (Aien & Mahdavi, 2020). Companies waste a lot of energy in their industry especially, in the airline industry. Consumption of energy can pollute the environment. Aircraft consume much fuel and produce a huge amount of Carbon dioxide which is an important reason for global warnings (www.ghasedak24.com, 2021). While airlines manager calculates problems of energy consumption, they should have more impressive programs than it like planting trees as it is an influential role to decrease the negative effect of carbon dioxide. Reduced air temperature due to trees can enhance air quality because the emission of many pollutants and chemicals is temperature-associated. Decreased air temperature can also decline ozone formation. Trees also remove pollution by intercepting aircraft particles. Several particles can be attracted into the tree, though most particles that are intercepted are retained on the plant surface (Nowak, 2002).

The effect of airport actions on water quality has been garnering attention as correctors look beyond the more clear sources of water pollution and attempt to solve issues. Airports, which typically include vast expanses of impervious surfaces and host activities that can produce

discharges of potential contaminants, have been subject to the requirements of the Clean Water Act's regulations for more than a decade, but the application of these rules to the unique operating environment of airports still is being refined. The relationship and occasional tension between protecting the environment and protecting the safety of the traveling public have arisen in the water quality context in two distinct areas: deicing and anti-icing agents, utilized to ensure safe work in cold temperatures or other conditions in which frost may form on aircraft surfaces, may have environmental impacts and multitude airports are located on large bodies of water which, along with interdependent marshes and wetlands, frequently provide habitat for a majority number of birds and waterfowl known to cause severe aircraft damage or aircraft crashes. (Trid.trb.org, 2006).

Aircraft noise has negative effects on people's health. A large number of people with hearing loss due to this condition is high and it can be considered one of the significant causes of this illness. The level of offer of humans and personnel to future airport noise and adjoining buildings is increasing as the population grows and airports expand, requiring more attention to the issue of noise pollution and that more acoustic coverings should be considered for exposed buildings in the context of noise prevention measures. The most influential people in airport noise are those that live in the vicinity of the airport or those who work in the air or ground part of an airport. Therefore, arrangements and plans are implemented in countries to decrease the effects of this pollution at the airports. The high intensity of aircraft noise that occurs naturally around large airports is known as increasing blood pressure as well as hearing loss. Noise pollution caused by different aircraft systems, including hydraulic, pneumatic, electrical, and aircraft accessories inside the hangars of Iran airports, as well as hangar structural equipment and systems, generally cause hearing impairment and disturbances of mentally operational personnel inside the hangar and can provide for the preparation of events. It is a huge threat to society's welling (Bagheri et al., 2019).

Aircraft have a lot of noise and it is not pleasant for passengers, aircrews and when airports are near cities choose new aircraft with less noise from Boeing and Airbus. Quality is so important for them and they produce comfortable aircraft without many noises. Airbus is a leading aircraft manufacturer whose customer focus, commercial know-how, technological leadership, and manufacturing efficiency have propelled it to the forefront of the aviation and air transport industries. The company's mission is to provide jetliners that are best suited to the market's needs and to support them with the highest quality of service. Airbus' modern and comprehensive product line – for which the company has received more than 19,000 orders globally (www.airbus.com, 2021). Boeing Company follows high standards in its function. Boeing employees are committed to the principles and values of the highest quality for their products. With more than \$3 billion invested annually in research and development, Boeing drives innovation that will transform aerospace as we know it (www.boeing.com, 2021), so Iranian airlines need to buy new aircraft from these companies.

Today, all companies need to have products and services of high quality as they have to compete with other companies and the airline industry is no exception from this base so they produce the best service for passengers. Iran airlines are not free like other countries' airlines though in some parts are great. Iran airlines cannot buy new aircraft and original equipment because of Iran's sanctions by The USE so some aircraft are not able to fly. (Wiki.pedia.org, 2021., <https://shawnvoyage.com>, 2014), But despite, the sanctions Iranian companies have achieved the technological know-how to produce glass, cabin filters, and nanotechnology-based coatings for aircraft, According to Fars News Agency, the Iranian airlines use special paints produced by the country's nanotechnology companies as a coating for the external surface of the aircraft used to carry people and cargo (<https://www.aviationpros.com>, 2021). Airline performance is important for their future, so they need to have a plan and use innovation. Iranian

airlines have enough new methods for the future, and with it, they would be successful and can improve their knowledge. In the country's comprehensive scientific map, the Aviation sector is in group "A" of priorities of technologies (Saghafi, 2020).

Five Iranian airlines studied in the present study, airline 3 obtain the first rank that show better performance compared to other airlines. Airlines 2, 1, and 4 respectively obtained second to fourth ranks. Airline 5 obtained the lowest rank among five Iran airlines showing airline 5 has the weakest performance in CSR. Sub-criterion related to CSR in Iran's airline industry was ranked on their priority and importance. The limitations of the present study were Iranian airlines and airports are security and research in this situation was so difficult. The present study can help airline managers to be familiar with influence factors. Governments and airlines manager can improve their strength and improve their weakness and utilize influence factors of CSR in their companies. In future studies, the researcher can employ fuzzy methods and use other MCDM methods in their study.

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