UNIVERSITAT POLITÈCNICA DE CATALUNYA
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Study of the feasibility of launching a new route from Doha to Buenos Aires by Qatar Airways

Document:
Report

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Degree:
Degree in Aerospace Technology Engineering

Call:
Spring, 2022

FINAL DEGREE THESIS

Abstract

Connectivity through air between South America and some countries the Middle East and the South of Asia is currently very limited. For this reason, it might be appealing to open a new air route that is non-existent at the moment, for which the feasibility of doing so between Doha and Buenos Aires by Qatar Airways was determined in this thesis. In order to do so, the layers of the business context were thoroughly assessed, these being the macro-environment, the sector, and the market. Subsequently, the organisation could be designed to best fit the needs of the environment.

It was found that the route should be executed with an Airbus A380, and it should have an annual average frequency of 0.89 daily flights. From the previously set characteristics of the route, a break even point of 88% of occupancy rate was obtained, along with a simple payback period of 5.63 years, a discounted payback period of 7.41 years, and a net present value after 10 years of 25% of the initial investment. Moreover, it was found that a direct route between the mentioned cities would reduce CO_2 emissions by a 29% with respect to the current alternatives.

All in all, the route could be categorized as feasible, although it was clear that it might be more economically efficient to delay the launch until the Argentine Government lowers its taxes for international air transport, as these are the major expense associated to this particular route.

Resum

La connectivitat aèria entre Amèrica del Sud i alguns països de l'Orient Mitjà i el Sud d'Àsia és actualment molt limitada. Per aquest motiu, podria resultar atractiu obrir una nova ruta aèria ara per ara inexistent, per la qual cosa s'ha determinat en aquesta tesi la viabilitat de fer-ho entre les ciutats de Doha i Buenos Aires per part de Qatar Airways. Amb aquest objectiu, s'ha avaluat a fons les capes del context empresarial, sent aquestes el macroentorn, el sector i el mercat. Posteriorment, s'ha dissenyat l'organització de manera que s'adapti de la millor manera possible a les necessitats de l'entorn.

Els resultats obtinguts han demostrat els beneficis d'executar la ruta amb un Airbus A380 i una freqüència mitjana anual de 0,89 vols diaris. A partir de les característiques de la ruta prèviament fixades, s'ha obtingut un punt d'equilibri del 88% de la taxa d'ocupació dels vols, juntament amb un període simple d'amortització de 5,63 anys, un període d'amortització descomptat de 7,41 anys i un valor actual net després de 10 anys del 25% de la inversió inicial. A més, s'ha comprovat que una ruta directa entre les ciutats esmentades reduiria les emissions de CO_2 en un 29% respecte a les alternatives actuals.

Amb tot, s'ha pogut classificar la nova ruta com a factible, tot i que ha quedat clar que seria més eficient econòmicament ajornar la inauguració fins que el govern argentí rebaixi els impostos pel transport aeri internacional, ja que aquests són la despesa principal associada a aquesta ruta en concret.

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Objective

The objective of this thesis is to evaluate the feasibility of launching a new air route between Doha and Buenos Aires by Qatar Airways. The general feasibility will depend on three main aspects, fact that derives smaller objectives from the fundamental. First, the economic feasibility, which will be assessed through an exhaustive analysis of the macro-environment, the sector, and the market. Second, the feasibility of the designed route from an organisation and planning point of view. Lastly, the feasibility of the air route considering its impact, this one being social, economic, and environmental.

Scope

The study of the feasibility of launching a new air route between Doha and Buenos Aires by Qatar Airways will include:

- ✓ A study of the macro-environment that might affect the launch of this new air route, which will incorporate:
  - A PESTEL analysis of the airline industry in Argentina.
  - An evaluation of the bilateral relations between Qatar and Argentina.
  - A global contextualization of the macro-environment situation and its current needs.
- ✓ A study of the sector of the airline industry focused in the launch of this new air route, including:
  - A SWOT analysis, discussing its strengths, weaknesses, opportunities, and threats.
  - A deliberation of Porter's five forces.
- ✓ A study of the demands of the existing market of this route and the estimation of potential new consumers.
- ✓ A proposal of the architecture of the air route, consisting of:
  - A route description of its itinerary and flight time.
  - The selection of the aircraft that best fits the route.

    - An evaluation of the internal value chain of the route.

- ✓ The economic feasibility of launching this new air route.
- ✓ An assessment of the impact it would have, including:
    - Social impact.
    - Economic impact.
    - Environmental impact.

The study of the feasibility of launching a new air route between Doha and Buenos Aires by Qatar Airways will not include:

- × A thorough study of the Covid-19 pandemic in the short term scenario nor its evolution in the long term.
- × A discussion of agreements with the origin and destination airports.
- × The debate of possible future modifications due to alterations in demand or other circumstances.
- × A collaboration with the airline nor the government of Argentina.
- × The physical implementation of this route.

Requirements

In order to consider the new air route between Doha and Buenos Aires feasible, it should meet the following requirements:

- Decrease the current total travel time by at least 3 hours.
- Have a break even point of an average of 80% or lower of the capacity of the airplane.
- Have a simple payback period of 6 years or less.
- Have a positive net present value of a 20% of the initial investment after 10 years.
- Reduce CO_2 emissions by at least a 20% with respect to the current route.

Justification

Offering a broad range of destinations will in most cases make an airline better known and acknowledged. Qatar Airways was awarded as the best airline in the world in 2021 by Skytrax World Airline Awards [1] with over 140 destinations across the world [2], however, it lacks of abundance of destinations in South America. What is more, its only destination in this continent is São Paulo, missing the opportunity to offer routes to other substantial cities, one of which could be Buenos Aires, given that it is the most visited city of South America, due to its architecture and rich cultural life [3]. In order to remain the best airline in the world, Qatar Airways might consider expanding the number of destinations they currently offer, in which case Buenos Aires should be of highest priority, given the facts that have been previously stated.

Notwithstanding, launching a new route requires a thorough analysis of its feasibility. This analysis usually follows three steps: making the decision, planning the route, and finally undertaking the launch operations [4]. The first step consists of making in-depth research about new opportunities, and when a new destination has been settled, predicting the future considering factors of the macro-environment, the sector, and the market. This step can also include the decision of the airline's aircraft that will be covering the route. The second step is all about planning, and consists of defining the route architecture, setting its schedule and frequency, and establishing the ticket selling price. Finally, the third and last step consists of carrying out the operations required by the actual launch of the route.

First of all, the need for a new air route between Doha and Buenos Aires must be assessed, given that it is the fact that arouses the basis of this thesis.

On a political note, Argentina and Qatar are both top trade destinations. What is more, exports from Argentina to Qatar have increased at an annualized rate of 10.9% from 1995 to 2019 up to $45.9 million, while exports from Qatar to Argentina have increased at an annualized rate of 49.1% from 1995 to 2019 up to $32.5 million [5]. An increase of the trade between these two countries enhances the need of communication through air between them, as air freight is fast and reliable over great distances, and therefore widely used for international trade.

On another note, tourism might also be an incentive for the launch of this route. As can be seen in Figure 1, international tourism in Argentina has increased a 223% from 1995 to 2019. Although international tourism in Qatar is currently not as desirable, given that it experienced a decrement of a 27% from 2016 to 2019, it is a country that has developed greatly over the last few years, and will continue to do so, which could definitely attract more international tourism in the near future. Moreover, although tourism from Argentines to Qatar is still uncertain, Qataris should undoubtedly demonstrate eagerness to visit Argentina, and more particularly its capital, Buenos Aires.

It is also very relevant to highlight the fact that travelling between Doha and Buenos Aires is currently possible through a layover in São Paulo. However, this not only is much less convenient for passengers, but it also contaminates significantly more than if a direct route was to be launched. The current route from Doha to São Paulo should under no circumstances be withdrawn, as there are many passengers that benefit from it, but its frequency could definitely be lowered, given that the airport of São Paulo would no longer be performing as a distributor to the rest of South America, especially to southernmost areas. In this case, a direct route from Doha to Buenos Aires would be much better for passengers travelling to places in the south of the country, allowing an overall reduction of air emissions.

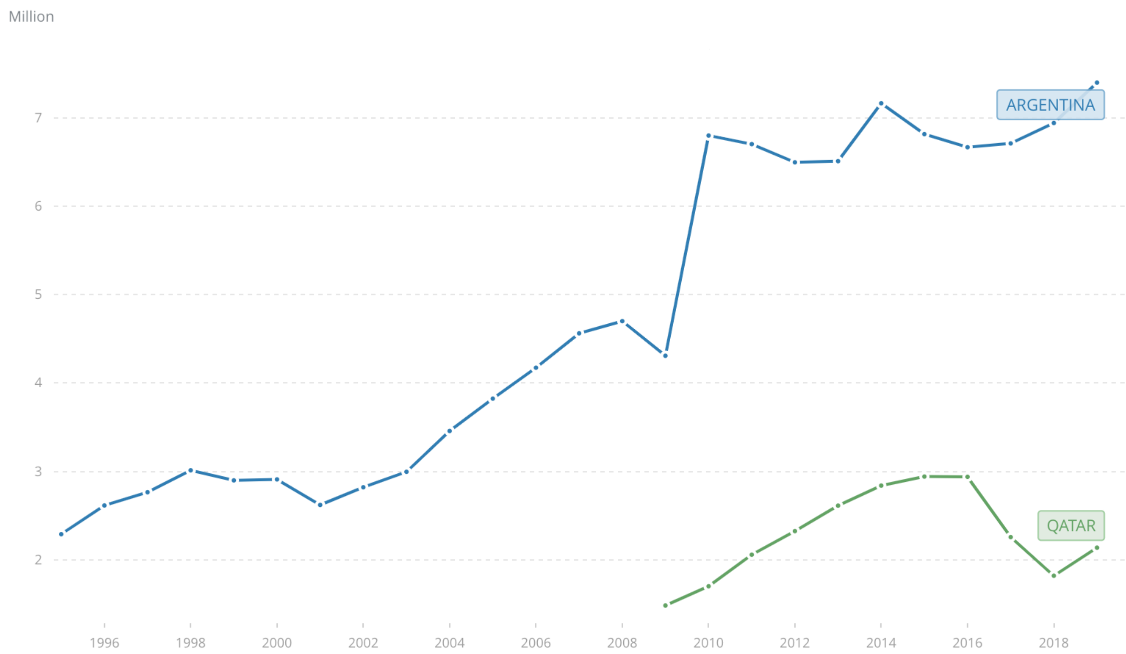


Figure 1: International tourism in Argentina and Qatar [6].

While those are the main external factors that prove the need of launching a new route between the mentioned two cities, its feasibility, along with its impact, must be assessed as well. Once the macro-environment, the sector, and the market have been analyzed, a proper route architecture will be established, from which the economic feasibility of the route will be evaluated. As for the impact, with the common purpose of keeping the society and economy of the affected countries stable, not to mention the need of limiting the environmental footprint to the minimum, the evaluation of the social, economic, and environmental impacts is of great importance as well.

All in all, the purpose of this thesis is not only to justify why this route should be launched, but also to determine if it is actually feasible from all the possible angles.

On account of everything mentioned before, the possibility of launching this particular air route should undoubtedly be considered, hence the required exhaustive study of its feasibility and impact must be estimated, which is what will be discussed thoroughly in this thesis.

Chapter 1

State of the art

1.1 Transatlantic flights

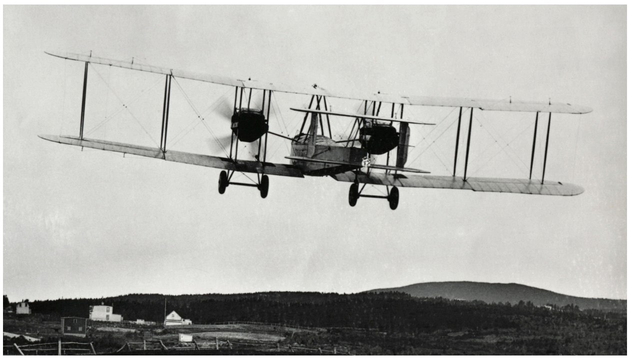


Figure 1.1: Alcock and Brown aboard their biplane taking off from Newfoundland and Labrador [7].

Captain John Alcock and Lieutenant Arthur Whitten Brown were the first two men to fly across the Atlantic Ocean over the night of June 14-15, 1919. They flew with their twin-engined Vickers Vimy biplane from St. John's, Newfoundland and Labrador, to Clifden, Ireland, which is a 3,040 kilometer trip. The flight lasted around 16 hours, flying at an average speed of 190 kilometers per hour [8].

In 1937, Imperial Airways was the first airline to successfully perform a transatlantic flight using the Short Empire seaplane, followed by Pan American with a Sikorsky S-42. Soon after, both airlines began effectuating regular seaplane routes [9].

Maturation of this technique came with World War II, as the desire of transporting materiel across the Atlantic Ocean paired up with the hazards of doing it by sea, which led to an evolution of flight technology in the form of bigger piston engines and longer runways [9].

No major development of this technique was necessary to get to modern travel. Airlines began to offer more routes with better aircrafts, which allowed shorter travel time and more flexibility. Supersonic flights were put into practice with the Concorde from 1976 to 2003, which flew from London (operated by British Airways) and Paris (operated by Air France) to New York. However, these concluded due to their high cost and economic infeasibility [9].

There are currently many airlines that offer this kind of air routes, connecting all the major cities in the continents through transoceanic flights.

1.2 Launching of new commercial routes

Although Covid-19 has put many obstacles in the way of travelling, new routes are still being launched or planned to be launched in 2022 due to the anticipation of a busy summer. However, most of these routes are short distance or at least intracontinental, and those that are long distance, intercontinental and transoceanic, frequently involve North America, especially the United States, but almost never South America [10].

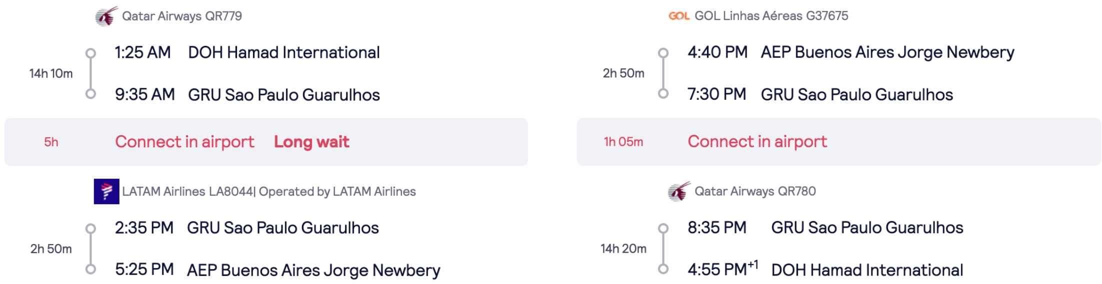
That is because the pandemic situation in South America has conduced its countries to implement very restrictive air travel measures, which has made travelling to those countries very troublesome. Subsequently, launching new routes to this continent might not appeal the airlines right now, but it could definitely point out the market's soft spot in this area for the near future. In this context, Airports Council International Latin America and the Caribbean (ACI-LAC) has recently recommended governments lowering air travel restrictions, in order to avoid jeopardising the recovery of the aviation and tourism industry. Moreover, the World Health Organization (WHO) has made clear that it does not support the travel ban [11]. These endorsements from such relevant organisations should undoubtedly conduct the continent's tourism to revive, which will definitely be an opportunity, now more than ever, for airlines to launch new routes to Latin America, given the currently diminished competition due to the pandemic.

1.3 Current roundtrip routes to travel between Doha and Buenos Aires

There is currently no direct flight between Doha and Buenos Aires. However, that does not mean that these two cities are not connected through an air route, but it is definitely a long one, with one or even multiple layovers.

Presently, the shortest option is connecting these two cities through a layover in São Paulo. Going from Doha to Buenos Aires, the first flight is operated by Qatar Airways, whereas the second one is operated by LATAM Airlines. On the way back, this being from Buenos Aires to Doha, the first flight is operated by GOL Linhas Aéreas, whereas the second one is operated by Qatar Airways. An overview of the roundtrip can be seen in Figure 1.2. The outbound flight has a total duration of 22 hours, while the return flight has a total duration of 18 hours and 15 minutes. Of course these durations might vary slightly when selecting other dates for the trip, but those would be minor alterations, thus this serves as an accurate example.

While that is currently the shortest option, there are other alternatives, which although are longer, they are also more budget friendly. There are currently three roundtrip options offered that fulfill the previously stated conditions. One of them is a connecting flight with only one layover, this one being in Miami. However, the average travel time of this one is 27 hours and 40 minutes. The other two options, although they have two layovers, are faster. They share the location of the second, this one being in São Paulo, though one has the first layover in Istanbul, whereas



(a) Outbound flight (b) Return flight

Figure 1.2: Shortest current roundtrip flight from Doha to Buenos Aires [12].

the second one has it in London. Their duration is very similar, this one being an approximate average of 24 hours and 40 minutes per trip.

Compared to the first option, the average duration of which is approximately 20 hours and 10 minutes per trip, the extra 7 hours and 30 minutes or the extra 4 hours and 30 minutes required by the other alternatives are in many cases not worth the trip, or at least not worth the saved money.

Once the current available routes have been laid out and their strengths and weaknesses have been discussed, a general conclusion can be extracted. Although there is certainly one option that proves to be the current best, it does not mean that another one that is even better cannot be designed and implemented.

1.4 Qatar Airways alliances

Airline alliances are partnerships between its member airlines that have many benefits, not only for the airlines but also for the consumers. Their collaborations allow them to share resources and pick up or extend partner routes. Moreover, consumers can take benefit of their often shared rewards programs, this meaning that they can earn and redeem points through the airlines that constitute the alliance. Alliances can often be detected through common occurrences, such as code-share flights or shared services [13]. The three major alliances are Star Alliance, SkyTeam and oneworld. Qatar Airways is a part of the latter, the member airlines of which can be seen in Figure 1.3.

Figure 1.3: oneworld member airlines [14].

In the study case of this thesis, the fact that Qatar Airways is part of oneworld could benefit it when launching this new route. This is because the most common collaborations mentioned before between member airlines does decrease competition among them, given that code-sharing flights would give an impulse to partner airlines to contribute with marketing tickets for the flight operated by Qatar, rather than launching a parallel route.

Aside from all the member airlines of the oneworld alliance, Qatar Airways has established partnerships with other airlines as well, these being Bangkok Airways, JetBlue, LATAM Airlines, MEA, Oman Air, and RwandAir [15]. From these, Qatar Airways could especially benefit from its partnership with LATAM Airlines with the launch of a new direct route between Doha and Buenos Aires, given that this airline offers a direct flight from Buenos Aires to Chile's capital, Santiago [16], and other areas of southern Latin America. Although this possibility already exists flying from São Paulo, offering more alternatives from which both airlines can benefit might be engaging.

1.5 Theoretical framework for analysis

In order to determine if the launch of a new route between Doha and Buenos Aires is feasible, the business environment needs to be studied. To do so, a reverse pyramid analysing approach will be taken, thoroughly analysing the layers of the operating environment, which will aid the structuring of the strategy insights [17].

These layers are the macro-environment, the sector, the market, and the organisation, which they all will be deeply analysed throughout this thesis. Figure 1.4 shows a graphic outline of the layers, all of them accompanied with the respective tools that will be implemented in each case.

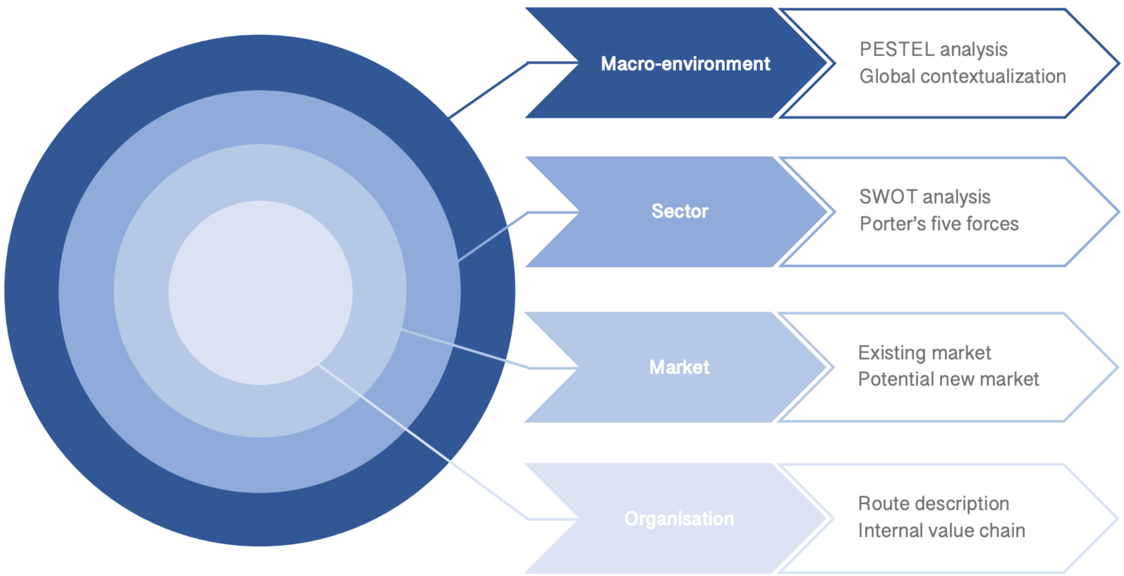


Figure 1.4: Outline of the theoretical framework for analysis.

Chapter 2

Macro-environment

2.1 PESTEL analysis

A PESTEL analysis is a business framework used to get an overview of the macro-environmental factors that affect a company or its activity. The key factors considered in a PESTEL analysis are depicted in Figure 2.1, and these are political, economic, social, technological, environmental, and legal. It is most useful when starting a new business or launching a new product, since it puts the unknown market into context [18].

In consideration of the fact that Doha should undoubtedly be one of the route ends, as it is Qatar Airways' hub, the country of which the factors included in the PESTEL analysis should be evaluated is Argentina.

2.1.1 Political factor

The political factor should take into account all the elements related to the government that could affect the launch of this new route between Doha and Buenos Aires. The main factors that will be analysed, given that they could affect the success of

Figure 2.1: Outline of a PESTEL analysis.

this air route, are political instability, international trade, internal emergency or war, tax policy for airlines, outbreak of diseases, and even a possible collaboration with the government [19].

In the first instance, a framework of the government of Argentina should be assembled. This South American country is a federal, democratic republic. Its power is divided between executive, legislative, and judicial branches, although it has been suggested by political analysts that it has a hyper-presidentialist system, somewhat centralized in the executive power, which is substantially wielded by the three-time president, Juan Peron, who is both head of state and government [20].

Although Argentina currently faces political challenges such as endemic corruption, low levels of public trust, and political polarization, it is considered one of the most stable democracies in Latin America [20]. The challenges mentioned before affect essentially Argentines, which means that they should not significantly influence tourist attraction. Moreover, despite its challenges, Argentina is considered a free and developed country, with political rights and civil liberties [21].

Argentina and Qatar are both top trade destinations. What is more, exports from Argentina to Qatar have increased at an annualized rate of 10.9% from 1995 to 2019 up to $45.9 million, while exports from Qatar to Argentina have increased at an annualized rate of 49.1% from 1995 to 2019 up to $32.5 million [5]. Trade between these two countries should enhance communication through air between them, as air freight is fast and reliable over great distances, and therefore widely used for international trade.

With regard to internal emergency or war, Argentina is currently not under any threats, and therefore this aspect should not affect the launch of the new air route.

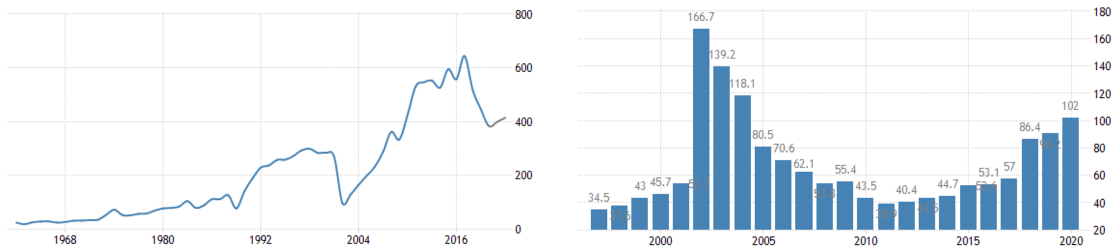
Taxes imposed for the operation of airlines could affect the demand of travel passes, given that is most common for airlines to charge these taxes directly to their customers. In Argentina, these are directly related to the landing and the parking of the aircrafts. For international flights, the lower the visibility category of the aircraft (which can be CAT I, CAT II, or CAT III) and the lower its maximum take-off weight, the higher the required tax [22], though it is true that government taxes in Argentina for international flights are quite high in any case. However, with the subsequent discussion of which aircraft is the best for the operation of this particular air route, the required tax should be evaluated more in-depth.

As for diseases, Covid-19 is currently the one that is the most worrying in Argentina. However, substantial progress has been made since the outbreak of the pandemic, and the disease should eventually be normalized and treated as a common flu. This, paired with the fact that this disease is globally present, should make it under no circumstances affect the demand of the new air route. On another note, the American Trypanosomiasis disease, also known as Chagas disease, should be taken into account as well. Yet it is present in Argentina and Latin America in general, it is most common in northern Argentina, near the borders of Argentina with Bolivia and Paraguay [23]. Nonetheless, this disease has been present for many years and is now controlled, and it is not especially distinctive in Argentina, which should not portend a decrease in demand.

Given that the aviation industry should be profitable in the long term, and tourism should undoubtedly encourage economic recovery, especially after the pandemic crisis, the government of Argentina could be interested in investing for the launch of new routes, in order to attract more tourists to its country. This suggestion is merely introduced here, and it is something that should be discussed directly with the president, but it is definitely worth evaluating the possibility of.

2.1.2 Economic factor

Argentina is the third-largest economy in Latin America, and it has still a high economic potential due to the development of renewable energy. However, its economy has shrunk considerably since 2018 as a result of over-reliance on commodity exports and unsustainable government spending [20]. This can be seen in Figure 2.2, where the Gross Domestic Product (GDP) has recently experienced a decrement and the government debt to GDP has experienced an increment.



(a) GDP

(b) Government debt to GDP

Figure 2.2: Economic data from Argentina [24][25].

Although its economic devaluation could directly affect the launch of the new air route, some aspects that could revoke this outcome should be discussed. Economic recovery has already initiated, managing a near 10% growth rate last year and a reduction of its primary budget deficit by 3.5% of GDP in 2021 [26]. Moreover, progress in vaccines and overall health recovery from the Covid-19 pandemic should slowly but surely aid the economy to transcend.

In this context, the pandemic crisis not only affects the planning of this new air route, but also the existing ones all over the world. As was mentioned in Section 1.2, many routes have been cancelled, which has led to a decrease of the competition. Although there is a reason for those routes being cancelled, there is also an opportunity when establishing a long term objective.

All things considered, the current state of the Argentine economy could unquestionably sabotage the short-term success of the air route between Doha and Buenos Aires affecting its demand, but its effects should be revoked in the long term and the current unambitious situation of the market competition could be pointing out an imminent market niche.

2.1.3 Social factor

The social factors that must be evaluated when launching a new air route basically consist of the image that potential customers have of the airline that is launching it. Therefore, this section will deal with previous accidents Qatar Airways has been a part of, the hospitality and services of the airline, as well as its reputation and previous customer complaints, and the comfort the the airline offers [19]. It is safe to mention that, given that Qatar Airways was awarded as the best airline in the world in 2021 by Skytrax World Airline Awards [1], social factors should definitely be contributors to the route's success.

All airlines have minor technical issues occasionally that, although they are not expected to affect the safety of the passengers greatly, they can surely be frightening for them. In this context, Qatar Airways is no exception, and has also experienced some troubles in many of their flights, which have been gathered in Table A.1 (see Appendix A). As can be seen in this one, there are many small incidents that happen frequently. Although these do not have any severe consequences, they can be scary and definitely have an impact on the airline's reputation. On another note, there have previously happened a few more severe accidents as well, which can be found in Table A.2 (see Appendix A).

Although it is true that these incidents and accidents do happen to all the airlines, it is very important to minimize them, in order to avoid feeding society's common fear of flying, which would have a devastating impact in the airline industry.

On account of the airline's hospitality and services, it needs to be mentioned that this one is impeccable. Passengers can enjoy on board some extraordinary cuisine and choose from up to 4,000 entertainment options. Moreover, Qatar Airways offers some of the widest and most spacious seats for all travel classes, aside from having one of the youngest fleets in the market [27].

Altogether, although the incidents and accidents could affect the airline's reputation, it was still awarded as the best airline in the world in 2021 by Skytrax World Airline Awards [1], which does definitely set the bar on the highest standards. Therefore, the social factor should not be perceived as an issue for the launch of this new route, but more as an opportunity, as the airline already has the customers' support.

2.1.4 Technological factor

In regard to the technological factor, it is safe to say that airlines must constantly invest in technology, in order to offer the best services to their customers. Moreover, technological progress also allows advances in security and safety, and upgrades on the aircrafts' communications with the air traffic can aid to prevent crashes or technical faults [19].

Qatar Airways is very aware of the fact that technology is a way of attracting customers. In this context, it offers fantastic on board technological service. What is more, it has been the first global airline to offer passengers 100% touch-free in-flight entertainment technology [28], the need for which aroused from the Covid-19 pandemic. Moreover, it was also the first airline in the Middle East to begin trialing IATA's Travel Pass 'Digital Passport' from March 2021 [29].

Technology advances in Hamad International Airport, which is Qatar Airways' hub, also add value to the airline. In this airport, in the wake of the pandemic, a disinfectant robot releasing concentrations of ultraviolet C light is being used in high traffic zones with the purpose of decreasing viruses and bacteria. Furthermore, smart screening helmets check all passengers using infrared thermal imaging, artificial intelligence, and augmented reality [31].

Figure 2.3: Smart screening helmets used in Hamad International Airport [30].

All in all, it is clear that Qatar Airways is at the forefront of technological advances and always tries to implement the newest developments into its operations. Akbar Al Baker, CEO of the Qatar Airways Group, states that the key to success is 'taking risks and being decisive', for which he aims to keep on revising the airline's operating strategies and operating pattern on a daily basis [31].

2.1.5 Environmental factor

The environmental factor is one of the most important in the airline industry, as it is crucial that the airlines calculate the carbon footprint and improve their systems to decrease harmful emissions. This not only aids in improving the airline's reputation, but it might attract investors as well. In order to spread their willingness to achieve a better relationship with the environment, it is very helpful to add messages in their campaigns that are conscious with this subject [19].

Aviation is an undeniable contributor of carbon dioxide emissions, as it emits pollutants directly into the upper atmosphere, and it accounts for approximately 2% of total man-made CO_2 emissions [32].

Qatar Airways is very aware of the current situation of climate change, and affirms that it is one of the biggest threats of our time. As a result, it implements several policies that have the aim of approaching aviation to environmental sustainability. In this context, as a oneworld member airline, it is committed to net zero carbon emissions by 2050 [33]. Moreover, it has implemented a carbon offset programme, empowering its passengers with the ability to offset carbon emissions from their flight at the time of booking by making a financial contribution to environmental and social projects [33].

Moreover, the airline has also transposed the International Air Transport Association Four-Pillar Strategy into its strategy. For this matter, it includes climate change into the factors that are considered when making decisions about technology, operations, and infrastructure. Furthermore, it is working to establish a viable pathway for the adoption of Sustainable Aviation Fuels (SAF), and it is compliant with the European Union Emissions Trading System (EU ETS), the United Kingdom Emission Trading System (UK ETS), and the Carbon Offsetting and Reduction Scheme for International (CORSIA) [33].

On another note, it also works towards reducing waste and water conservation, it meets the industry best practice for noise and air quality, it is the first carrier in the Middle East certified to the highest level of IATA's Environmental Assessment programme (IEnvA), and it implements wildlife protection policies [33].

Altogether, although there is still much more to be accomplished in this subject by the aviation industry, Qatar Airways is undeniably trying to take a step forward towards the right direction, which should definitely help in boosting the airline's image, aside from solving the problem itself.

2.1.6 Legal factor

As for the legal factor, this one should consider the legal restrictions in Argentina for the airline industry that might affect the launch of the new route. The Argentine laws for aviation are comprised in the country's Aeronautical Code. Next, there is a recap of the most important laws included in this code [34] that Qatar Airways should assess before launching a new route to Buenos Aires.

- Article 97 provides that "the executive power, for general interest reasons, may authorise foreign companies to perform domestic air services, subject to reciprocity".

- Article 105 provides that "no concession or authorisation shall be granted without prior verification of the operator's technical and economic–financial capacity, as well as its ability to use the airport, auxiliary services and flight material in a proper manner".

- Article 131 provides that "to perform aerial work in any of the specialities, operators should obtain prior authorisation from the National Civil Aviation Administration (ANAC), which will verify their technical and financial capacity".

- Article 138 provides that "routes that represent a general interest for the country may receive subsidies".

- Pursuant to Article 139, "the carrier shall be liable for damage caused by death or bodily injury suffered by any passenger when the accident that caused the damage has occurred on board the aircraft or during takeoff or landing operations".

Although these are the most important laws that apply when considering the launch of a new route to Argentina, there are many more laws gathered in the Argentine Aeronautical Code that should be assessed more in-depth.

2.2 Bilateral relations between Qatar and Argentina

Bilateral relations between the State of Qatar and the Republic of Argentina date from a joint declaration issued on June 15, 1974, in New York, where the pillars of the diplomatic relations between Doha and Buenos Aires were set up. The relation developed significantly after both countries signed a Memorandum Of Understanding in February 1994 for the exchange of diplomatic missions. The Argentine government inaugurated its embassy in Doha in 2012, and the State of Qatar did so in Buenos Aires in 2013 [35].

(a) Embassy of the State of Qatar in Buenos Aires

(b) Embassy of the Republic of Argentina in Doha

Figure 2.4: Embassies of Qatar and Argentina in the other country [35][36].

In the fields of economy, commerce, industry, sports, tourism, and culture, several agreements and memorandums of understanding have been signed between these two countries, and various others are expected to be signed in the near future [35].

The Economic, Trade and Technical Cooperation Agreement was signed by the State of Qatar and the Republic of Argentina in Buenos Aires on January 18, 2010. This one stipulated that the Joint Ministerial Trade Commission was to be established between the two governments, which was later signed in 2014 and entered into force in November, 2016 [35].

2.3 Global contextualization

Once all the factors of the macro-environment have been deeply analysed, a global contextualization can be assembled, which consists of a summary of the factors previously seen that will perform as opportunities and threats to the launch of the new route between Doha and Buenos Aires.

The political factor has proven to provide many assets for the launch of this new route. In the first instance, Argentina is one of the most stable democracies in Latin America, and is considered a free and developed country, with political rights and civil liberties. Moreover, trade between these two countries has increased over the last few years, which should enhance communication through air between them. On the other hand, however, government taxes are a true potential political threat to the launch of this route, though they will be assessed more in-depth in subsequent chapters. Covid-19 could be a slight threat to the success of this route in the short term as well, but should under no circumstances be a threat in the long term. Lastly, given that tourism should undoubtedly encourage economic recovery after the pandemic crisis, the government of Argentina could be interested in investing for the launch of this new route, which would be very economically beneficial for the airline.

The economic factor could unquestionably sabotage the short-term success of the new air route affecting its demand, given the current state of the Argentine economy. However, its effects should be revoked in the long term, which makes it a transient threat. On another note, the current unambitious situation of the market competition could be pointing out an imminent market niche.

The social factor is unquestionably an asset for Qatar Airways. As was previously seen, there have been incidents and accidents in the past that could have a slight impact on the airline's reputation. However, this one was still awarded as the best airline in the world in 2021 by Skytrax World Airline Awards, which undoubtedly boosted the airline's reputation substantially.

On the subject of the technological factor, it is clear that Qatar Airways is at the forefront of advances and always tries to implement the newest developments into its operations, which could definitely be classified as an opportunity of the airline.

As for the environmental factor, it is a delicate one. On the one hand, there is still much progress to be made in the subject of sustainability for the aviation industry. However, on the other hand, Qatar Airways is undeniably trying to take a step forward towards the right direction, which should definitely help in, aside from working out a solution for the problem in the future, improving the airline's image. Moreover, the fact that a direct route should be less environmentally harmful is a very important aspect to consider as well.

The legal factor cannot be perceived as an opportunity nor a threat. While there are no strict laws that could impact the air route's success, the airline still needs to comply with the laws, which can require some minor adjustments of its operation.

All things considered, it is safe to say that, although some complications have been found as well, the macro-environment has proven to be reasonably optimal for the launch of this new route.

Chapter 3

Sector

In order to analyse the sector affecting the potential launch of the route, a SWOT analysis and a thorough discussion of Porter's five forces will be carried out next.

3.1 SWOT analysis

A SWOT analysis is a management and strategic planning technique widely used by organisations when they are considering the launch of a new product, service or initiative, and it provides with information about internal factors, such as strengths and weaknesses of the organisation, as well as external factors, such as opportunities and threats of the market [37].

In this context, the information that the study of the macro-environment has provided will be very useful for the development of the SWOT analysis, especially in regards to the external factors, which will be classified in opportunities or threats.

The conducted SWOT analysis for the launch of the new air route between Doha and Buenos Aires by Qatar Airways can be found in Table 3.1. While the factors are merely introduced in it, as this one is supposed to be very graphic and concise, the ones that were not formerly discussed in previous sections will be subsequently reviewed, which are mainly those listed as strengths and weaknesses.

Table 3.1: SWOT analysis conducted for the launch of the new air route between Doha and Buenos Aires by Qatar Airways.

STRENGTHS	WEAKNESSES
• Faster than the existent alternative. • Lower harmful emissions than an indirect route. • Possibility of establishing a reasonably high ticket selling price. • Income provided by this air route expected to grow in the future. • Established strategic alliances.	• Considerable investment. • Ignorance of the air route's true acceptance and demand. • Possibility of a high spoilage rate by passengers. • Large workforce required.
OPPORTUNITIES	**THREATS**
• Non-existent competition of the same air route. • Qatar Airways' favourable reputation. • Airline at the forefront of technological advances. • Trade between Qatar and Argentina has increased over the last few years. • Possibility of receiving subsidies from the Argentine government. • The Republic of Argentina is one of the most stable democracies in Latin America and the third-largest economy. • Contributor to the recovery of the tourism sector, especially in all southern Latin America, the Middle East, and Asia.	• Present sanitary and economic crises caused by the Covid-19 pandemic. • Current economic situation in Argentina caused by an over-reliance on commodity exports and an unsustainable government spending. • Very harmful emissions of the current aviation industry.

As for the strengths, the fact that a direct route would be faster is undeniable. Moreover, although the current flights between Doha and São Paulo and between São Paulo and Buenos Aires should not be cancelled with the launch of the new route, their frequency should be decreased, which would mean that those passengers travelling to Buenos Aires or southern Latin America areas would take the new route, which would contribute to lowering harmful emissions due to more direct travels. On another note, by virtue of the airline's nature and the route characteristics, aside from the lack of direct competitiveness, reasonably high ticket selling prices could be established, which would still be expected to grow hand in hand with income increases in the future. On a final note, the fact that Qatar Airways is a oneworld member should hinder possible future competitiveness, as code-sharing among airlines in the alliance could be more profitable than launching their own route.

With respect to the weaknesses, the launch of a new route always involves a high investment, whether this one is caused by an aircraft replacement or the buying of a new one. Moreover, as this would be the first direct flight between Doha and Buenos Aires, its acceptance and demand have not yet been exposed, which means that the route would be launched merely with information provided by studies, from which the reality could differ. Furthermore, although cancellation charges and non-refundable policies could be implemented, the airline industry still faces major losses due to high spoilage rates. Lastly, for the operation of any air route, a large workforce is required, as it needs a substantial amount of labour to operate properly.

It must be mentioned that the elements categorized as opportunities and threats were introduced in previous sections, as they refer to external factors related to the macro-environment, thus they are not further discussed in this one.

Once all the information deducted from the SWOT analysis has been assessed, it is safe to say that it proves to be favourable for the launch of this new route. While there are still major weaknesses and threats that could spoil the success of this route, many more strengths and opportunities have been obtained, which leads to think that it is a relatively safe expansion of the airline's destination catalogue.

3.2 Porter's five forces

Michael E. Porter first introduced his groundbreaking five forces framework in an article for the magazine Harvard Business Review in 1979. This framework had the aim of illustrating the competitiveness of an industry in order to determine its ultimate profit potential [38]. He stated that competitors in an industry were not only other *players*, but also other factors that he included in his five forces framework [38] (see Figure 3.1).

Figure 3.1: Porter's five forces [38].

In this section, all five of these forces related to the launch of this particular route between Doha and Buenos Aires will be assessed.

3.2.1 Competition in the industry

The first force that Porter considered that could be threatening for a company is the existent competition in the industry, referring to other companies that provide similar products or services and that could take away part of the target [39]. In the context of launching a new route from Doha to Buenos Aires by Qatar Airways, some factors must be assessed.

In the first instance, the information provided in section 1.3 should be retrieved. Figure 1.2 shows the shortest current way to travel from Doha to Buenos Aires, which is through a layover in São Paulo. The fact about this alternative route is that the first flight, from Doha to São Paulo, is operated by Qatar Airways as well. This means that, although it could definitely steal some passengers from the direct route, the company would still benefit from that. However, if that was the case most of the time for passengers travelling from Doha to Buenos Aires or southern Argentine areas, it would not be profitable for Qatar Airways to launch the potential new route. Yet, given that a direct route should undoubtedly be more convenient to those passengers travelling to places closer to Buenos Aires than São Paulo, as total travel time reduces considerably, the only factor that could cause passengers to opt for the connecting flight would be the price. For this matter, the price of the direct flight should be close to the existing ones or even reasonably higher, always keeping in mind the relation between consumer comfort and the price that they are willing to pay. Nevertheless, even if the price was the exact same as the current one, Qatar Airways would still make greater profit, as the company would receive the total amount of the cost of the plane ticket, whereas in the connecting flight this one should be proportionally distributed among the participant airlines.

On another note, although the mentioned connecting route is the current shortest, it is not the only available one, as was seen in section 1.3. What is more, there is another option of travelling from Doha to Buenos Aires through a single layover in Miami. Both of the flights of this alternative are operated by American Airlines, which could be quite engaging for passengers, but the total travel time increases by approximately 37% with respect to the current route offered by Qatar Airways depicted in Figure 1.2. Given the time increase, and although the price is slightly lower, this alternative should not be as appealing to consumers, and therefore will not compete directly with the new route.

For the same reason, the other current alternative routes introduced in section 1.3 will not be considered as direct competition either, as not only they increase travel time approximately by a 22% in comparison with the current fastest route, but the decrease in consumer comfort caused by an extra layover is greater than the minimal supplemental cost of the more direct route.

In conclusion, competition in the industry in this case is limited, and the route that would perform as the main competitor is partially operated by Qatar Airways, which although is not desirable, lowers the economic risk of the airline as a company when launching the new route. However, it has been seen that the new direct route between Doha and Buenos Aires should under no circumstances be expected to fail on account of the competition in the industry.

3.2.2 Potential of new entrants into the industry

The potential of new entrants into an industry should be evaluated as well when characterising its competition. This one will be favourable for existing companies in an industry with strong entry barriers, given that it will take too much time and money for other companies to enter [39]. In order to determine if the environment is favourable for Qatar Airways in this context, the main affecting factors are analysed next.

The most important is to how many and which airlines the two airports involved perform as a hub. This is because most airlines offer routes from their hub to other cities, especially when the flights are transoceanic, which means that potential new entrants should be the airlines that have their hub in one of the two cities involved in the route. On one hand, Hamad International Airport in Doha is hub solely to Qatar Airways, as this one is the only existent Qatari airline. For this reason, there should not be any threatening entrants from this side. On the other hand, Ministro Pistarini International Airport in Buenos Aires is hub to Aerolíneas Argentinas and Flybondi. The second one is a low-cost airline operating inside South America [40], and therefore will currently not consider launching a route to Doha. However, Aerolíneas Argentinas does offer transoceanic flights [41], thus it could be interested in launching a new route from Buenos Aires to Doha if the route proves to have good results for Qatar Airways. In this context, the information about Qatar Airways' alliances should be retrieved. As can be seen in Figure 1.3, Aerolíneas Argentinas is not a member of oneworld, which means that the two airlines do not currently have any type of alliance that could hinder the entry of the Argentine airline into the industry.

Accordingly, there is only one potential entrant that could be interested in launching the same route. If that was the case, Qatar Airways and Aerolíneas Argentinas would enter a battle of price and offered comfort in order to be the passengers' preferred. However, it is important to keep in mind that the launch of a transoceanic route requires a considerable investment by the airline, and if there is already an alternative that covers the same route, it will not be profitable for new airlines to do the same, unless the existent demand is higher than the existent offer, in which case the success of the route launched by Qatar Airways would not be sabotaged, but the potential frequency could be limited by the competition.

3.2.3 Power of suppliers

A company's suppliers have substantial power on its competitiveness in a certain industry. In order to determine how much power they have, as this one varies from one industry to the other, some factors must be analysed, such as how easy it is for them to increase their prices, how unique the products that they provide are, and how expensive it is for the company to change supplier if needed [39].

In the case of an airline, very few suppliers are needed in the development chain of the service. They can be distributed in two main groups: punctual suppliers and recurring suppliers. The first are the ones that supply the aircraft at the beginning of the service, whereas the second are those that supply products or services that are recurrently used in the operation of an airline.

Recurring suppliers of an airline can be IT contractors, caterers, aircraft parts suppliers, overseas maintenance contractors, fuel suppliers, ground handlers and private security firms [42]. Most of these suppliers offer products and services that are very similar to those offered by other companies, which means that they are limited to maintaining their prices competitive, and that if that is not the case, the airline could easily change of supplier. Moreover, it is relevant to mention that, in the case of Qatar Airways, some of these supplies are covered by the Qatar Airways Group [43], as can be seen in Figure 3.2, and therefore operate with the airline's best interest in mind. However, there are other suppliers that are more complicated to replace, for example fuel suppliers, as they are usually provided by the airport and the selection does not depend on the airline. However, if a fuel supplier increased their prices considerably, the airport would consider changing suppliers, as these try to maintain a good relationship with their operating airlines. Thus, although the airline cannot actively participate in the making of this decision, the fuel supplier could still be replaced by the airport if needed.

Figure 3.2: Supplies covered by Qatar Airways Group [43].

On the other hand, the suppliers of the airline's aircrafts are much more complicated to replace. In the case of Qatar Airways, these are Boeing and Airbus, which are the two most important aircraft manufacturers in the world. In this context, these supply to almost all the airlines globally, meaning that if they increased their prices, the entire airline industry would be affected negatively, which would conclude in no competitive advantage or disadvantage of any airline for a specific route.

Taking into account everything that has been mentioned before, it is safe to say that Qatar Airways' competitiveness does not depend excessively on its suppliers, and therefore their power in this industry is moderately limited.

3.2.4 Power of customers

The power that customers have over a company is another one of Porter's five forces. This one is defined by the size of the client base and how easy it is for customers to switch from one company to the other, which they will do depending on who offers the best value for money [39].

In the airline industry, the power of customers is extremely high, as it requires minimal effort to book a flight with one carrier or the other. What is more, an excessively high percentage of customers book their trips on third-party websites that compare prices of the offered alternatives for them, and usually opt for the cheapest deal [44]. For this reason, it is extremely important for airlines to offer a desirable level of comfort at a competitive price.

However, in the case of launching this particular new route, the power of customers behaves slightly different. This is because, as was previously discussed, there is no other company that offers the exact same service to the customer. Although there are other alternatives, these are not as convenient for passengers travelling from Doha to Buenos Aires or southern Latin America areas. Consequently, the power of customers is not as strong in this environment, as it requires a higher effort for them to switch to another carrier. Nonetheless, the price of the direct route offered by Qatar Airways should under no circumstances be excessively high, or customers will value the cost more than the comfort and opt for other alternatives.

3.2.5 Threat of substitute services

The final force included in Porter's model is the threat of substitute products or, in this case, services. This one considers the power of other options that will satisfy the customers' needs equally, but is a different product or service than the one the company offers [39].

Therefore, it is important to keep in mind that substitute services in the airline industry are not flights offered by other carriers, which in the present case were already discussed in section 3.2.1. In fact, substitute services in the airline industry are other means of transportation that will allow a person to make the same trip, such as car, train, bus, or boat. For this reason, there are no real substitute services for the air route between Doha and Buenos Aires, as the only possible option would be travelling by boat, but is still not really comparable, as it requires an extremely longer travel time and therefore is not suitable for customers looking for a fast mean of transportation.

3.3 Overall sector condition

Firstly, the SWOT analysis carried out in this section proved to be favourable for the launch of the new air route. The weaknesses and threats obtained were considerably compensated by the strengths and opportunities, and although they could still have an effect on the operation of the route once this one is launched, their influence towards evaluating if the launch is feasible or not is not sufficiently significant.

Moreover, the analysis of Porter's five forces also proved to be overall convenient for the launch of this new service. However, while competition in the industry is currently very limited, there is one potential entrant into the industry: Aerolíneas Argentinas. Nonetheless, this is under no circumstances a justification for not launching the new route, given that this airline has not even showed any interest yet in doing so itself. Furthermore, Qatar Airways' competitiveness does not currently depend excessively on its suppliers, therefore limiting their power. The customers, when offered a reasonable price, have their power limited as well, given the fact that there is not an exact same service offered by any other organisation. Lastly, there is no threat of substitute services, as there are no other means of transportation of similar characteristics.

In consideration of everything that has been formerly mentioned, it is safe to say that the condition of the sector is currently favourable for the launch of the new route between Doha and Buenos Aires by Qatar Airways.

Chapter 4

Market

In the first instance, the existing market related to the objective of this thesis will be analysed. The forgathered information will allow the quantification of the Total Available Market (TAM), the Serviceable Available Market (SAM), and the Serviceable Obtainable Market (SOM) for this route, all of them related to the existing market. It is necessary to mention that, in order to obviate the pandemic's effect, given that this one is irrelevant for the planning of the new route in the long term, all the data that has been looked up is from 2019.

Moreover, the new potential market will be considered as well, given that this route would open up a multitude of opportunities for people living in many of the countries in South America, any country in eastern Middle East, and southern Asia. The achieved estimation of the new potential market will be combined to estimate as precisely as possible the future demand of this route.

4.1 Existing market

The existing market will be analysed through the quantification of the Total Available Market (TAM), the Serviceable Available Market (SAM), and the Serviceable

Obtainable Market (SOM). It is relevant to mention that, given that all the numbers that will be used, although very accurate, are not exact, they will be rounded to their corresponding number of significant figures.

4.1.1 Total Available Market (TAM)

The Total Available Market (TAM) of the service Qatar Airways offers is the total air travel industry. It is composed by the total number of passengers carried by all air transport companies, which in 2019 was around 4.5 billion, according to the International Civil Aviation Organization (ICAO), 3.6% higher than the previous year [45].

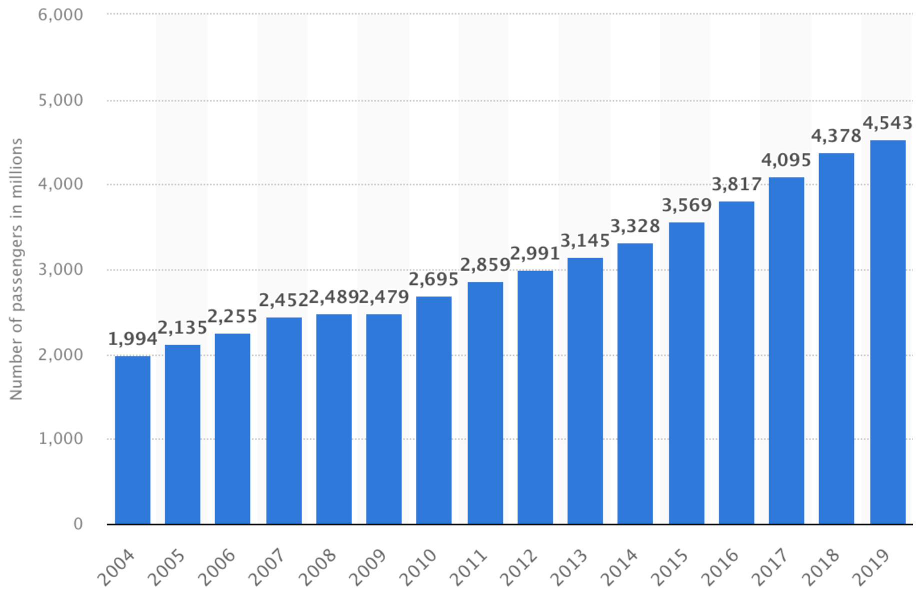


Figure 4.1: Annual number of scheduled passengers boarded by the global airline industry [46].

The increase in the number of passengers over the years can be seen in Figure 4.1, which shows the annual number of scheduled passengers boarded by the global airline industry from 2004 to 2019. Although this is not relevant for the determination of the TAM, as this one has already been found to be 4,543 million, it is one more demonstration that the air travel industry was growing considerably before Covid-19, and is expected to return to its previous behaviour quite soon.

4.1.2 Serviceable Available Market (SAM)

In order to determine the Serviceable Available Market (SAM), some assumptions must be made.

In the first instance, it must be stated that the existing routes between São Paulo and the cities in the Middle East are not used uniquely by passengers travelling between Qatar and Argentina, but also by passengers travelling between many countries in South America and any country in eastern Middle East and southern Asia. This is because there are no direct routes between most international cities in these regions, meaning that the passengers travelling between them must inevitably travel through a layover somewhere in Europe or the Middle East. More concretely, the countries that benefit from transatlantic routes between cities in central and southern South America and the above mentioned regions have been listed in Table 4.1.

Table 4.1: Countries that benefit from transatlantic air routes between central and southern South America and the Middle East and Asia.

Continent or region	Countries
South America	Argentina, Bolivia, Brazil, Chile, Paraguay, Uruguay
Middle East	Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Yemen
Asia	Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia, China, India, Indonesia, Japan, Kyrgyzstan, Laos, Malaysia, Maldives, Mongolia, Myanmar, Nepal, North Korea, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Tajikistan, Thailand, Timor-Leste, Turkmenistan, Uzbekistan, Vietnam

When travelling between one of the listed countries in South America and any of the listed countries in the Middle East or Asia, having a layover in the Middle East should be much faster than having it in Europe, making flights between South America and the Middle East more appealing than the alternatives.

In order to estimate the Serviceable Available Market (SAM), the annual number of passengers taking a transatlantic trip between any of the listed countries has been looked up and noted in Table B.1 (see Appendix B). The latter row of this one shows the total number of tourists exchanged between the listed countries, which is approximately 1.61 million.

However, it must be kept in mind that, although the assembled data is very accurate, information from a few countries was missing. Moreover, Table B.1 considers uniquely tourists, though there are other passengers that take advantage of these transoceanic routes for business purposes as well. In consideration of the previous two aspects, it seems appropriate to add a margin of a 5%, achieving a total of approximately 1.69 million annual passengers.

Moreover, most travellers performing this kind of transoceanic trips usually take the opportunity to visit more than one country abroad, especially those residing in South America and travelling to the Middle East or Asia. These passengers have been counted every time they enter the border of a new country, though they take advantage of the current transoceanic air routes only once. For this reason, a 35% has been deducted from the last estimation, achieving a total of approximately 1.10 million.

Finally, it must be stated that all of these passengers will need to return to their country of residence, for which they will use the current transoceanic air routes again. Therefore, the final SAM will be 2.20 million.

4.1.3 Serviceable Obtainable Market (SOM)

The Serviceable Obtainable Market (SOM) is composed by those passengers included in the SAM that would prefer a transoceanic route between Doha and Buenos Aires, rather than the ones that are currently available, which have been noted in Table 4.2.

Table 4.2: Current routes between listed countries in South America and listed countries in the Middle East and Asia [47].

City A	City B	Airline
São Paulo, Brazil	Doha, Qatar	Qatar Airways
São Paulo, Brazil	Dubai, United Arab Emirates	Emirates

As can be seen, the current offer is very limited. Therefore, it is safe to deduce that, from all the passengers considered in the SAM, a 90% of those travelling from and to Argentina, a 5% of those travelling from and to Chile, and a 5% of those travelling from and to Uruguay, would prefer having a transoceanic route between Buenos Aires and Doha.

In order to estimate a number of how many passengers the SOM represents, a table with all necessary information to do so has been compiled (see Table 4.3). In this one, three main factors have been considered: the first is the percentage of residents in the corresponding country that would prefer a direct route between Doha and Buenos Aires; the second is the percentage that the country represents over the total number of passengers considered in the SAM; and the third is the final correction factor previously assumed when computing the SAM.

Table 4.3: Serviceable Obtainable Market (SOM).

Country	Percentage[a]	Percentage[b]	Correction factor[c]	Total number of passengers	Round trip
Argentina	90	23.76	0.68	235,499	470,998
Chile	5	17.14	0.68	9,434	18,868
Uruguay	5	2.12	0.68	1,169	2,338
Serviceable Obtainable Market (SOM)					**492,204**

[a] Percentage of country residents preferring a direct route between Doha and Buenos Aires
[b] Country's percentage of total exchanged tourists considered in the SAM
[c] Correction factor previously assumed when computing the SAM, which is the combination of a 5% increase and a 35% decrease

At last, the Serviceable Obtainable Market (SOM) has been obtained from Table 4.3, with approximately 0.49 million passengers. This one, along with the TAM and the SAM, has been graphically represented in Figure 4.2.

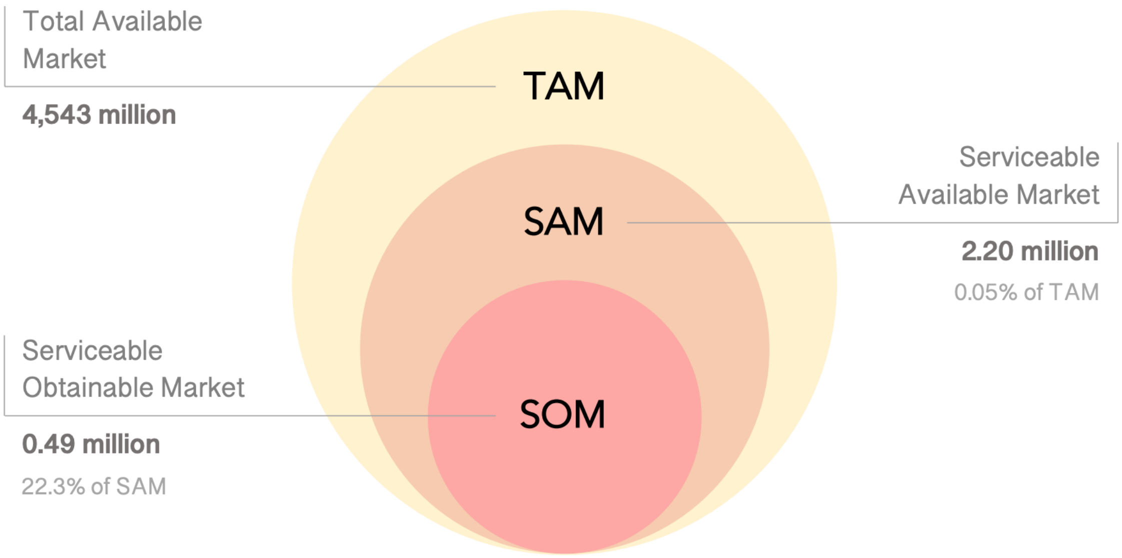


Figure 4.2: Existing market.

4.2 Potential new market

Given the fact that the offer of transoceanic flights between the listed countries in Table 4.1 is currently very limited, the demand for them is also restricted. In this context, it is safe to assume that the launch of a new route connecting Doha and Buenos Aires should awake the interest of a totally new sector of the population of the listed countries.

Most people factor in travel time as one of the ingredients to decide where to go on holiday. This is because travel time and comfort are highly related and inversely proportional, which means that when the first increases, the second decreases. Undoubtedly, comfort is one of the most valuable aspects for travellers all over the world. Therefore, a direct route between Doha and Buenos Aires should make the opposite region more accessible for people travelling from central and southern

South America to the Middle East or Asia and vice versa, decreasing the required travel time and increasing comfort, leading to an increase in demand as well.

For the mentioned arguments, it is reasonable to conclude that the Serviceable Obtainable Market (SOM) quantified in the previous section should be modified according to the assumption that there is a sector of the market that was not interested in travelling between those regions, but will be as a result of the new route launched by Qatar Airways. Consequently, a margin of a 10% has been added to the SOM, the result of which can be seen in Table 4.4.

Table 4.4: Number of annual passengers.

Estimated existing market	**Potential new market**	**Number of annual passengers of the new route**
492,204	10%	541,424

Lastly, it is concluded that the computing of the TAM, the SAM, and the SOM, has allowed to make an estimation of the existing market of the route. The estimation of the potential market could be added to this one, obtaining the final number of annual passengers that can be expected for the new route, which is approximately 541,000.

Chapter 5

Organisation

The purpose of this chapter is to describe the architecture of the route to be launched by Qatar Airways. To do so, the route should be planned first, computing and establishing the most relevant aspects for its most adequate operation. Once that is done, it will be possible to identify the elements and activities that constitute the route's internal value chain.

5.1 Route architecture

At the outset, it is crucial to plan the new transatlantic route, for which the flight path, the flight time, the selection of the aircraft, the frequency and the daily schedule, and the annual distribution need to be assessed.

5.1.1 Flight path

Foremost, it is necessary to mark the flight path on a world map. For obvious reasons, the main being economic and convenience, this one needs to be the shortest possible, thus the flight path between Doha and Buenos Aires has been determined to be geodesic.

In order to draw it on a map, an online software called Great Circle Map [48] has been used. This one allows drawing and calculating the distance between two airports in the world, which are the required inputs of the program. By introducing the airports needed for the new route, which are Hamad International Airport (DOH) in Doha and Ministro Pistarini International Airport (EZE) in Buenos Aires, the route has been easily marked on the map, which can be seen in Figure 5.1.

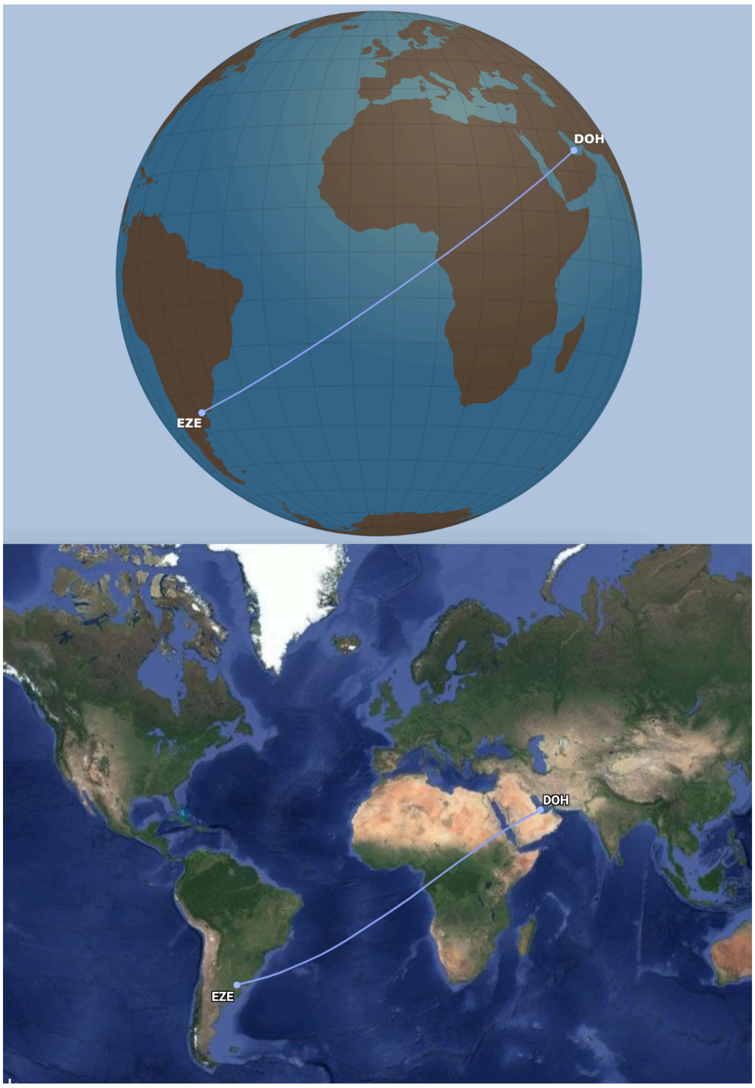


Figure 5.1: Flight path of the air route between Doha and Buenos Aires [48].

The marked flight path has a total ground distance of 13,338 km, which will be subsequently needed for the aircraft selection and the flight time computation.

5.1.2 Aircraft selection

In order to determine the best aircraft to implement the new route, the different aircraft models of the Qatar Airways fleet have been gathered in Table 5.1, alongside with their most relevant specifications.

Conductive to making a first selection, the International Civil Aviation Organisation (ICAO) has been consulted to verify if the aircrafts of the Qatar Airways fleet satisfy the requirements related to the range and the compulsory reserve fuel. More concretely, Annex 6 of the Standards and Recommended Practices (SARPS) stipulates that ”A flight shall not be commenced unless the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight. In addition, a reserve shall be carried to provide for contingencies.” [49] The amount of reserve fuel is specified by each country, for which civil aviation regulations in Qatar and Argentina need to be looked up. It is relevant to mention that, given the fact that it is not known when an alternate airport will be needed, this situation is the one that will be considered, as it is the most limiting.

The Qatar Civil Aviation Regulations stipulate that, for instrumental flight rules (IFR), ”The pilot-in-command shall only commence a flight if the aeroplane carries sufficient fuel and oil for, when a destination alternate is required, to fly to the aerodrome of intended landing, to an alternate aerodrome and thereafter to fly for at least 45 minutes at normal cruising altitude.” [50] Flying from Doha to Buenos Aires, the closest international airport that could be used as an alternate due to bad weather at the destination is Carrasco International Airport (MVD) in Montevideo, Uruguay, which is 322 km away [51]. By taking into account the Qatar Civil Aviation Regulations and the distance to the alternate airport, the actual range of the aircraft should be no less than 14,340 km.

On the other hand, the Argentina Civil Aviation Regulations stipulate that ”The pre-flight calculation of usable fuel will include planned trip fuel, contingency fuel, which will be 5% of planned trip fuel, fuel required to fly to an alternate aerodrome, and final reserve fuel, which will be the amount of fuel needed to fly for 30 minutes at holding speed at 450 m above destination aerodrome elevation under normal conditions." [52] Flying from Buenos Aires to Doha, the closest international airport that could be used as an alternate due to bad weather at the destination is Kish International Airport (KIH) in Kish, Iran, which is 281 km away [53]. By taking into account the Argentina Civil Aviation Regulations and the distance to the alternate airport, the actual range of the aircraft should be no less than 14,500 km.

Given that the Argentina Civil Aviation Regulations are more limiting, these will be used for the first selection. As can be seen in Table 5.1, the aircrafts of the Qatar Airways fleet that have ranges lower than 14,500 km have been discarded.

Table 5.1: Qatar Airways fleet [54][55][56].

Aircraft	Count	Seating capacity	Range [km]	
Airbus A320-200	29	132 / 144	4,630	×
Airbus A321-200	3	182	5,100	×
Airbus A330-200	6	260	13,450	×
Airbus A330-300	8	295 / 305	11,750	×
Airbus A350-900	34	283	15,000	✓
Airbus A350-1000	19	327	16,100	✓
Airbus A380	10	517	15,000	✓
Boeing 787-8	30	254	13,530	×
Boeing 787-9	7	311	14,010	×
Boeing 777-200LR	9	272 / 276	15,843	✓
Boeing 777-300ER	48	354 / 358 / 412	13,649	×

Therefore, the selection should be between the Airbus A350-900, the Airbus A350-1000, the Airbus A380, and the Boeing 777-200LR. In order to determine which of these aircrafts is the most suitable for the implementation of the new route, an Ordered Weighted Average (OWA) method will be applied. To do so, the main criteria that will be taken into account will be the purchasing cost per passenger, the cruise speed, the payload per passenger, and the range. These have all been gathered in Table 5.2.

Table 5.2: Main criteria to be considered in the OWA [55][56][57].

Criteria	Airbus A350-900	Airbus A350-1000	Airbus A380	Boeing 777-200LR
Purchasing cost per passenger [$M/pax]	1.09	1.09	0.68	1.06
Cruise speed [km/h]	904	945	1,050	905
Payload per passenger [kg/-pax]	153.71	207.95	160.54	231.73
Range [km]	15,000	16,100	15,000	15,843

The following step is to normalize the values in Table 5.2. A 5.0 has been assigned to the most desirable value of each criterion, while a 1.0 has been assigned to the least desirable. Performing a linear regression between the two, the grades for the options that have values in between can be obtained. All of these results are displayed in Table 5.3.

Table 5.3: Normalization of the main criteria to be considered in the OWA.

Criteria	Airbus A350-900	Airbus A350-1000	Airbus A380	Boeing 777-200LR
Purchasing cost per passenger	1.0	1.0	5.0	1.29
Cruise speed	1.0	2.12	5.0	1.03
Payload per passenger	1.0	3.78	1.35	5.0
Range	1.0	5.0	1.0	4.07

From the normalization and the weight of each criterion, the OWA method can be applied by using equation 5.1. All the needed information, along with the final results, have been gathered in Table 5.4.

$$OWA = \frac{\sum_{i=1}^{n} p_i \times g_i}{p_{max} \times \sum_{i=1}^{n} g_i} \tag{5.1}$$

Table 5.4: Results obtained with the OWA.

Criteria	**Weight**	**Airbus A350-900**		**Airbus A350-1000**		**Airbus A380**		**Boeing 777-200LR**	
	g	p	$g \times p$	p	$g \times p$	p	$g \times p$	p	$g \times p$
Purchasing cost per passenger	40	1.0	40	1.0	40	5.0	200	1.29	51.6
Cruise speed	25	1.0	25	2.12	53	5.0	125	1.03	25.8
Payload per passenger	20	1.0	20	3.78	75.6	1.35	27	5.0	100
Range	15	1.0	15	5.0	75	1.0	15	4.07	61.1
Sum	100		100		243.6		367		238.5
OWA			**1.0**		**2.44**		**3.67**		**2.39**

As can be observed in Table 5.4, the aircraft that best fits the new transoceanic route between Doha and Buenos Aires is the Airbus A380, which can be seen in Figure 5.2, thus this one shall be used.

Figure 5.2: Qatar Airways' Airbus A380 [58].

5.1.3 Flight time

The same software used for the drawing of the flight path provided the ground distance between the two airports, which is 13,338 km. In order to compute the flight time, the aircraft's indicative performance data needed to be introduced, for which it was very useful to have previously determined the type of aircraft that should implement the route. The indicative performance data of the Airbus A380 can be seen in Figure 5.3.

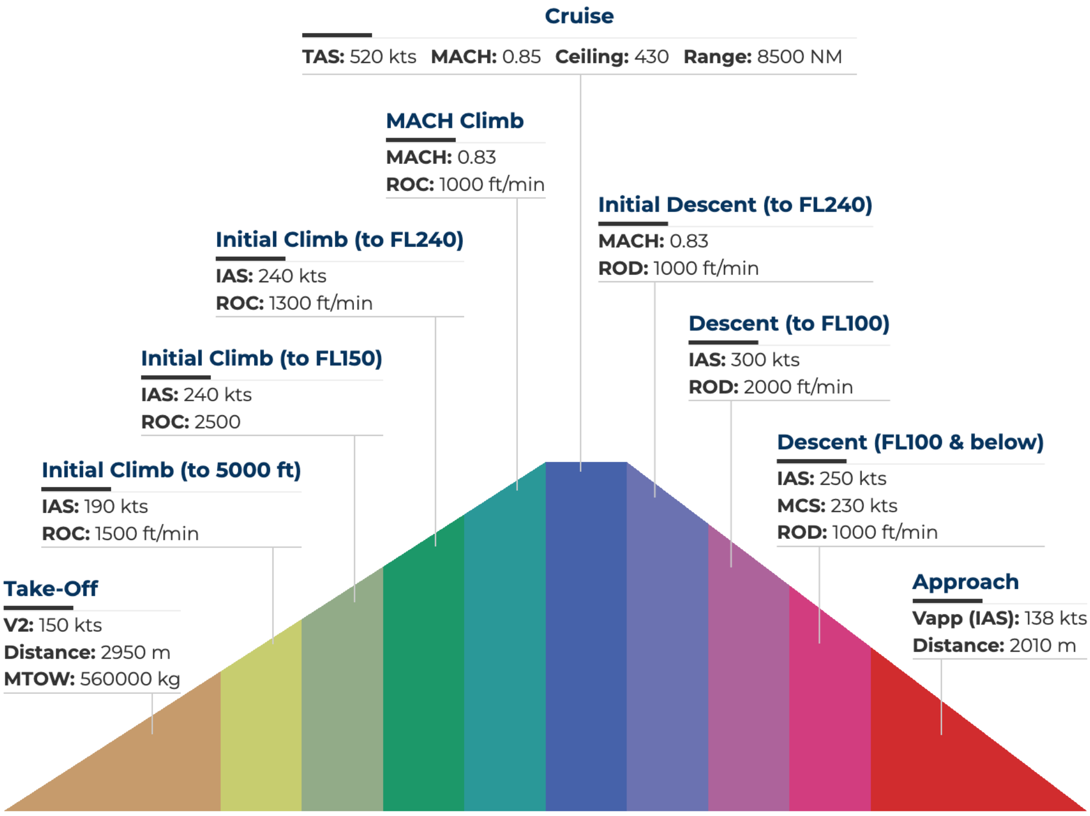


Figure 5.3: Indicative performance data of the Airbus A380 [59].

In order to determine an approximate flight time, a MATLAB code was computed, which has been included in Appendix C. In this one, the aircraft's indicative performance data was introduced as an input of the program, along with the typical cruise altitude and the total distance between the two airports.

First, the indicated airspeed (IAS) of the climb and descend phases was converted to true airspeed (TAS), knowing that the second will be a 2% higher than the first for every 1,000 feet of altitude [60]. Moreover, the invested time in climbing and descending could be computed from the rate of climb or descent and the altitude of each phase. By adding together the time of each phase, the total time invested in climbing and descending could be obtained, along with the travelled ground distance. The distance required for the climb and descent phases could be deducted from the total distance between the two airports, from which the distance travelled at cruise speed was obtained. From that, the time invested in the cruise phase was easily computed.

Finally, the obtained time and distance required by the climb, cruise, and descent phases has been noted in Table 5.5. As can be seen, the total flight time obtained is 14 hours and 46 minutes. It must be kept in mind that this flight time is merely an approximation, and could easily vary slightly due to wind.

Table 5.5: Flight time computation results.

Phase	Distance	Time
Climb	294 km	25 minutes
Cruise	12,670 km	13 hours and 53 minutes
Descent	374 km	28 minutes
Total	**13,338 km**	**14 hours and 46 minutes**

5.1.4 Theoretical frequency

The daily frequency of the transoceanic route can be easily computed from the number of annual passengers, which was obtained in section 4.2, and the seating capacity of the chosen aircraft. Equation 5.2 shows the calculation to do so. It is important to keep in mind that, as it is divided by 2, the daily frequency will provide with the number of departures from only one of the airports, therefore the daily flights, accounting for both ways, should be double that.

$$\text{Daily frequency} = \frac{\text{Number of annual passengers}}{\text{Seating capacity} \cdot 2 \cdot 365} \tag{5.2}$$

By substituting the corresponding values, the following daily frequency is obtained:

$$\text{Daily frequency} = \frac{541{,}000}{517 \cdot 2 \cdot 365} = 1.43 \text{ daily flights}$$

This frequency represents the average frequency of the route throughout the year. For this reason, I would recommend establishing a frequency of 1 daily departure from each airport, and possibly increasing it to 2 during high season. However, this will be discussed more in-depth in the following section.

5.1.5 Annual distribution and schedule

In order to determine the daily schedule of the route, the annual distribution needs to be assessed first.

December and January are a high tourist season in South America. This is because while in the northern hemisphere it is winter during those months, in the southern hemisphere it is summer, which drives many tourists to spend their Christmas holidays there. At the same time, the longer holidays in South America fall into those months as well, inducing an increase of the demand of air routes by the residents of South America. On the other hand, the longer holidays in the northern hemisphere are generally around July and August, which also derives into a higher demand during those months. Therefore, high season of the air route between Doha and Buenos Aires should be the months of December, January, July, and August.

Keeping in mind what has been formerly introduced, along with the average daily frequency obtained in the previous section, the daily schedule of the route can be determined.

5.1.5.1 Low season

During low season, only one aircraft should operate the route. Considering the previously obtained flight time, which has been rounded up to 15 hours for the development of this task, as well as the preferred departure times for customers, the schedule that has been found to fit best is the one depicted in Figure 5.4. It is relevant to mention that all times are local, and that the time difference between the two countries, which is 6 hours, was taken into consideration for the determination of those times.

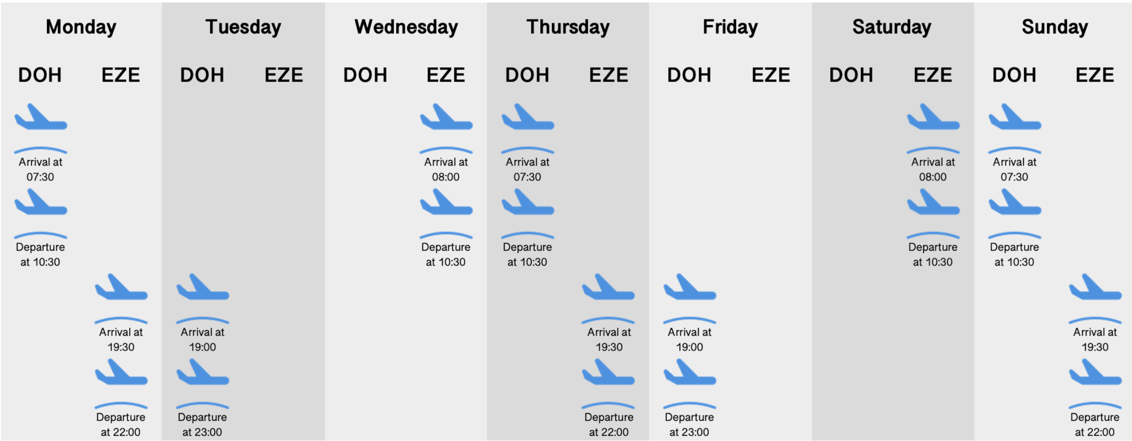


Figure 5.4: Schedule to be implemented during low season.

As can be seen, this schedule offers one daily departure from each airport, with the exception of two days a week. Every three days, the pattern is repeated, meaning that the weekly schedule will shift one day to the left every week, so it will not always be the same.

In the case of Ministro Pistarini International Airport (EZE) in Buenos Aires, the departure time switches between 10:30 and 22:00, in order to offer two widely different options to customers, though repeating the pattern every three days. On the other hand, in the case of Hamad International Airport (DOH) in Doha, the departure time switches between 10:30 and 23:00.

By following this schedule, the aircraft would be unproductive, this meaning that it is stopped at an airport, for a maximum time of 4 hours at Qatar Airways' hub. Moreover, the shortest period of time that the aircraft is stopped is 2 hours and 30 minutes, which is enough time to refuel an Airbus A380.

5.1.5.2 High season

During high season, two aircrafts should operate the route. Considering the previously obtained flight time, which has been rounded up to 15 hours for the development of this task, as well as the preferred departure times for customers, the schedule that has been found to fit best is the one depicted in Figure 5.5. In this one, one aircraft is represented in blue, whereas the other is represented in green. It is relevant to mention that all times are local, and that the time difference between the two countries, which is 6 hours, was taken into consideration for the determination of those times.

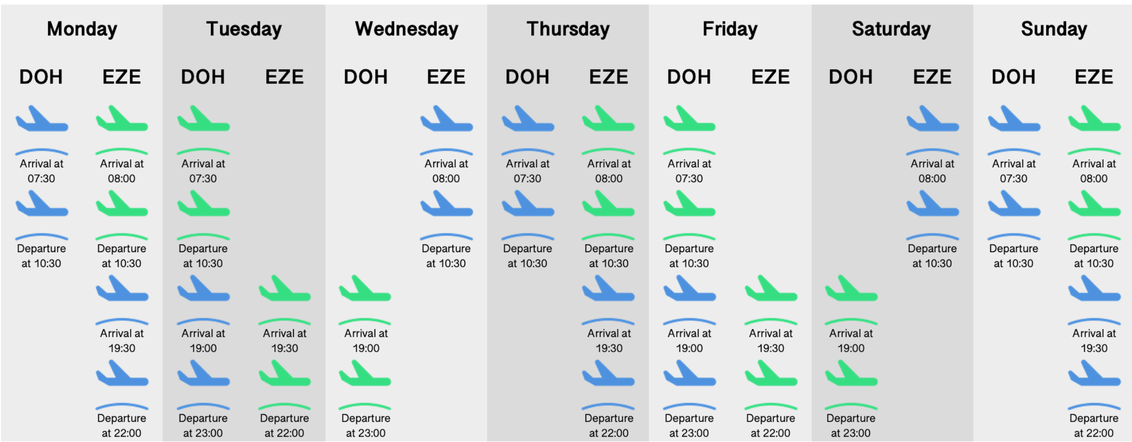


Figure 5.5: Schedule to be implemented during high season.

As can be seen, this schedule offers one daily departure from each airport two days in a row, and the next it offers two departures in one day. Every three days, the pattern is repeated, meaning that the weekly schedule will shift one day to the left every week, so it will not always be the same.

Just like during low season, the departure time switches between 10:30 and 22:00

in the case of Ministro Pistarini International Airport (EZE) in Buenos Aires, while it switches between 10:30 and 23:00 in the case of Hamad International Airport (DOH) in Doha.

By following this schedule, the aircrafts would be unproductive, this meaning that they are stopped at an airport, for a maximum time of 4 hours at Qatar Airways' hub. Moreover, the shortest period of time that the aircrafts are stopped is 2 hours and 30 minutes, which is enough time to refuel an Airbus A380.

5.1.5.3 Actual frequency from seasonal schedule

Once the seasonal schedule has been established, the actual average frequency should be reevaluated, in order to confirm that this one is aligned with that obtained theoretically.

First, the frequency of both schedules needs to be computed. During low season, there are two departures every three days, achieving a frequency of 0.67 daily flights. During high season, there are four departures every three days, achieving a frequency of 1.33 daily flights.

Considering that high season is during the months of December, January, July, and August, and low season during the rest, the actual average daily frequency can be estimated as follows:

$$\text{Daily frequency} = 0.67 \cdot \frac{241}{365} + 1.33 \cdot \frac{124}{365} = 0.89 \text{ daily flights}$$

As can be observed, this one is relatively lower than the one obtained theoretically. However, for the launch of a new route, for which actual demand is not known from past experience, it is better to go under the expected frequency, in order to avoid taking any higher risks than necessary. For this reason, this average daily frequency is considered appropriate, always keeping in mind that it could be increased in the future according to real demand.

5.1.6 General overview

As a general overview of everything that has been previously discussed, a table with a summary of the results obtained for the route architecture has been composed (see Table 5.6).

Table 5.6: Summary of the relevant data for the route architecture.

Aircraft selection	Airbus A380
Flight time	14 hours and 46 minutes
Annual distribution	Low season (February, March, April, May, June, September, October, November): 1 aircraft High season (January, July, August, December): 2 aircrafts
Annual average frequency	0.89 daily flights in each direction

5.2 Internal value chain

The concept of the internal value chain was developed by Michael E. Porter, and its analysis in an organisation allows to identify the activities that make up the value of this one in the market of a specific product or service. The activities that conform the internal value chain can be distributed in primary activities and support activities. The first group is compiled by those activities that are directly required for the development of the product or service, while the second group helps the primary activities to become more efficient [61]. All of the specific activities included in each main group have been gathered in Figure 5.6.

It is relevant to mention that not all activities go into the development process of any product or service. For this reason, the first step when conducting an internal value chain analysis of a specific product or service is to identify which of them apply to the case.

From the introduced theoretical framework of this technique, it is possible to proceed to the specific analysis for the launch of Qatar Airways' new route between

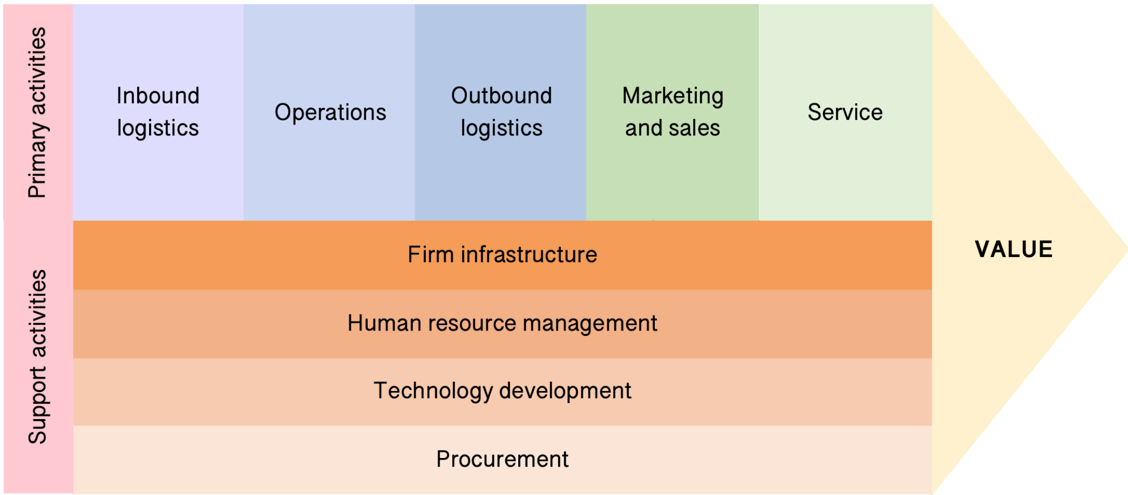


Figure 5.6: Outline of the internal value chain.

Doha and Buenos Aires, which will be conducted next. It must be kept in mind that the service offered by Qatar Airways is merely the air route, and under no circumstances should the internal value chain of this service include activities conducted by other companies present at the involved airports. Once the primary and support activities that take place for the launch of this new route have been discussed, a general analysis will be conducted, in order to estimate the value that each activity brings to the final service.

5.2.1 Primary activities

First, the primary activities needed for the implementation of the new transoceanic route between Doha and Buenos Aires will be assessed. All those included in Figure 5.6 are required for the execution of the transoceanic route, and therefore will be subsequently discussed.

5.2.1.1 Inbound and outbound logistics

Inbound and outbound logistics will be relevant in the case in point for the adequate reception of goods from company suppliers. Moreover, if an agreement with distribution companies has been established for this route, cargo and other packages will be carried in the hold of the airplane as well, along with baggage. For this reason, although the warehousing and inventory management of packages and manufactured goods will be conducted for the most part by external companies, it is responsibility of Qatar Airways the receiving, sorting, transferring, and handing over of those, activities that make up the inbound and outbound logistics section of the internal value chain.

In this context, Qatar Airways' competitive advantage in regards to inbound and outbound logistics is generated by the on-going and successful relationships that it has established with suppliers and distribution companies [62].

5.2.1.2 Operations

The operations of Qatar Airways' value chain for the new air route refer to all activities carried out by the airline's staff that allow to prepare the aircraft for each flight. These include the connection of the airplane's electrical system to a large ground-power cable from the terminal's power supply or a mobile generator, the mating of a jet bridge, stairs or a ramp to the cabin door, the off and on-loading of baggage and cargo, the replacement of catering carts, either a simple tidy-up or an extensive cleaning of the cabin depending on the duration of the layover, the refilling of water tanks, and the refueling of the aircraft [63].

Within this framework, Qatar Airways' operations are known to be outstandingly efficient, which definitely provides the company with a competitive advantage over other airlines.

5.2.1.3 Marketing and sales

Activities included in the marketing and sales block are the promotion, advertising, and pricing strategy related to a specific product or service [61].

When a company brings something new to the market, it is especially important to invest in promotion and advertising, in order to make it broadly known, which is the case of Qatar Airways with the launch of the new transoceanic route. The airline should take up activities related to the promotion and advertising of the new route, which should not be too difficult, given that the airline maintains a frequent and close communication with its customers through several channels [62], which also adds to its competitive advantage.

5.2.1.4 Service

The service block of the value chain refers to all the activities that take place after a sale has been made, and its purpose is to establish a closer relationship with the customer [61].

In the case of Qatar Airways' new route, these activities will relate to the service offered on board and after the flight, such as catering or customer service, which should all be impeccable considering that the airline's services were awarded as the best in the world.

5.2.2 Support activities

On another note, support activities are those that help primary activities become more efficient [61].

For the case in point, all support activities included in Figure 5.6 will be relevant, with the exception of procurement. This is because this block refers to the sourcing of equipment and services, which does not necessarily take place in the process chain for the operation of the flight. Nonetheless, the rest of support activities will be introduced next.

5.2.2.1 Firm infrastructure

Firm infrastructure activities include the company's overhead and management and strategic and financial planning [61].

Qatar Airways achieves a competitive advantage over other airlines especially through the vast amount of information, knowledge and expertise that the company possesses [62].

5.2.2.2 Human resource management

Activities related to human resource management, such as recruitment, hiring, training, development, retention, and compensation of employees [61], are crucial in terms of developing a competitive advantage in the market, especially when a service is being offered.

For this reason, Qatar Airways regularly devises programs and initiatives that have the purpose of increasing the employees' satisfaction levels and consequently their efficiency and motivation at their job [62].

5.2.2.3 Technology development

The technology development block of the internal value chain is related to activities including the research and development of the product or service that is being offered, such as product design, market research, and process development [61].

In the present case, and after a thorough analysis in section 2.1.4, it is safe to assert that Qatar Airways recognizes the importance of technology in the services it offers, and it is for that reason that the airline periodically invests in technological innovations [62], which not only boost customer satisfaction, but also enhance the company's competitive advantage in this sense.

5.2.3 General analysis

In the first instance, it is relevant to mention that the cost of each activity plays a significant role when deciding which of them need to be improved or cut back in order to increase the margin of added value of a product or service. However, in this case, the cost of each activity is, on one hand, very inflexible, especially if the airline aims to maintain its award for being the best airline in the world. On the other, the costs associated to a particular route will not be modified and differentiated from the rest of routes operated by Qatar Airways, as they should all follow the company's established policies. For this reason, in this case it makes very little sense to measure the added value of each activity in relation to its cost, as this is usually conducted when some internal modifications are being considered.

However, one factor that does have an influence on the margin of added value to any route operated by the airline is the inter-dependency between the activities, given that an improvement or a worsening of the implementation of one activity might have a bigger impact than expected on the value of the route. The inter-dependency between the activities formerly explained can be seen in Figure 5.7.

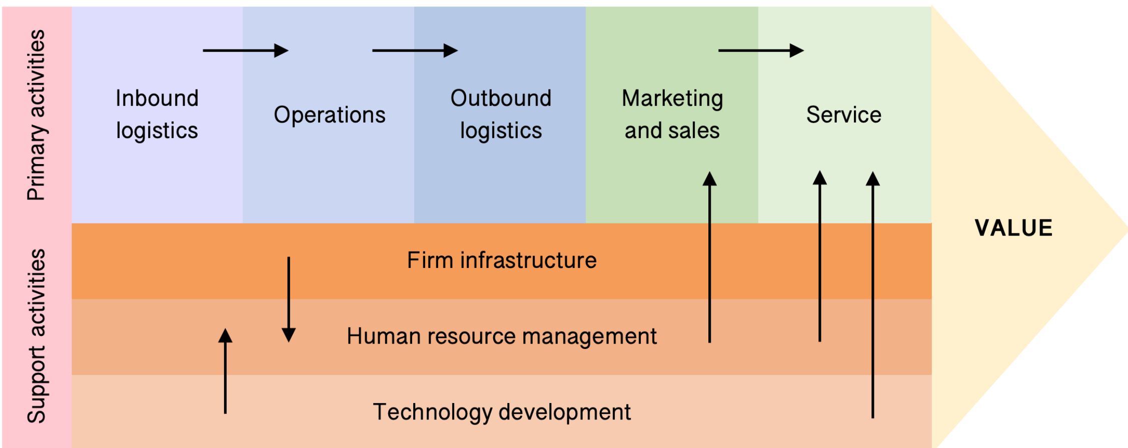


Figure 5.7: Inter-dependency between value activities.

Once each activity has been assessed and the inter-dependency between all of them has been recognized, a general conclusion can be drawn. All in all, it is safe to mention that the current position of the airline in the market and its outstanding internal operations make adding value to any of its services noticeably more effortless. The airline has proven to achieve a competitive advantage in all the activities included in the process chain, which leads to deduce that the new route will benefit from this added value as well.

Chapter 6

Economic feasibility

When considering the launch of a new product or service into the market, its economic feasibility must undoubtedly be assessed first. Through a thorough analysis of its production and maintenance costs, a profitable selling price can be determined, and the acceptance of it in the market can be estimated.

For this reason, the costs associated to the launch of a direct route between Doha and Buenos Aires by Qatar Airways need to be evaluated first. In order to do so, they have been classified between fixed costs generated by the new route, and flight operating costs, which will all be thoroughly analysed next. It is relevant to mention that some of this data was burdensome to find, so all of it should be understood as an estimate. For this reason, all the costs were rounded to significant figures, as although they are accurate, they must not be taken as exact.

Once this has been done, a final budget for the route will be devised. From this one, the main economic parameters will be computed, which will finally determine if the launch of this route is truly feasible from an economic point of view.

6.1 Fixed costs

As can be deduced, fixed costs that airlines face are not usually attributed to a single flight or route. However, in order to compute a budget for this specific route, they need to be factored into flight costs as well. The main fixed costs that will be subsequently considered are aircraft amortization, aircraft maintenance, insurance, and staff and management [64].

6.1.1 Aircraft amortization

The cost of the aircraft to carry out any type of route is one of the major costs that the airlines have to face. However, airlines usually buy aircrafts from the major manufacturers at very discounted prices in comparison to their list price, which definitely needs to be considered.

For the particular case in point, the cost of an Airbus A380 for airlines is around 225 million euros, which has a 45% discount applied from its list price [65]. The computation of its amortization will be conducted according to the previously set seasonal schedule, and the normal amortization time of this type of aircraft, which is 12 years [66].

During low season, one aircraft is required, whereas during high season two aircrafts are required. Therefore, one aircraft will be amortized the whole year, whereas the other one will be amortized around a third of the year. Keeping this in mind, the following calculation allows to estimate the cost of aircraft amortization during the accounting period of one year.

$$\text{Annual aircraft amortization} = \frac{225{,}000{,}000\left(1+\dfrac{124}{365}\right)}{12} = 25{,}119{,}863 \text{ €}$$

Thus, the cost of the aircraft amortization to be considered for this route is approximately 25.12 million euros annually.

6.1.2 Aircraft maintenance costs

The cost of an aircraft is not comprised uniquely by its acquisition price, but its maintenance costs need to be considered as well. Maintenance of an aircraft includes periodic inspections and possible repairs, and its cost depends on the characteristics of the aircraft. For an Airbus A380, the maintenance costs are expected to be 6.47 million euros annually [67]. From the seasonal schedule for this route, this particular cost can be computed as follows.

$$\text{Annual aircraft maintenance cost} = 6{,}470{,}000\left(1+\frac{124}{365}\right) = 8{,}668{,}027\ €$$

Therefore, the aircraft maintenance costs for this route have shown to be around 8.67 million euros annually.

6.1.3 Insurance costs

Insurance costs for a single aircraft depend on its capacity and the amount of time it is in the air. An accurate way of estimating the annual insurance costs of an aircraft is by computing the amount of hours that this one is expected to be in the air during a year, and multiply the result by the hourly cost of the insurance. As no reliable data was found for the insurance costs of an Airbus A380, this one was estimated from several sources based on the cost for similar aircrafts, achieving a cost of 85 €/h. From this value, the annual cost can be computed thusly, for which it was needed the number of flights per accounting period, which is 652 flights, and the duration of each flight, this one being 14.77 hours.

$$\text{Annual insurance costs} = 652 \cdot 14.77 \cdot 85 = 818{,}396\ €$$

Accordingly, the annual insurance costs of this route can be expected to be around 820,000 €.

6.1.4 Staff and management

For the adequate operation of a new route, it is necessary to extend the flight operations department of the airline. This department ensures a safe, punctual, and economic operation of flights, a correct scheduling and airport assessment, and all cockpit and cabin crew training. They are also responsible for making sure that all operated flights by the airline are in compliance with the applicable national and international regulations [68].

Given the importance of this department, the launch of a new route by an airline will undoubtedly require to enlarge it. However, marginal physical productivity decreases as the number of routes offered by the airline increases, meaning that the launch of a new route will require a smaller factor of production than all previously launched routes.

For the case in point, ten additional workers will be considered. The average salary of an operations officer in Qatar Airways is around QR 14,000 per month [69], which translates to 44,000 €/year. Therefore, the total annual cost destined to the hiring of new staff is expected to be 440,000 € approximately.

6.2 Flight operating costs

Flight operating costs are the costs that an airline faces that can be directly attributed to a specific flight. The main flight operating costs are the staff of the airplane (pilot and crew members), fuel, airport fees, government taxes, and overflight fees [64].

6.2.1 Airplane staff

An Airbus A380 is usually crewed by 2 to 4 pilots (depending on the duration of the flight), and 21 flight attendants [70]. They all usually earn a fixed monthly or annual salary, although its cost can be easily attributed to a single flight.

The average salary of a Qatar Airways' pilot is around QR 60,000 per month [71], which translates to 187,000 €/year, whereas the average salary of a Qatar Airways' flight attendant for a long-haul flight is around QR 12,000 per month [72], which translates to 37,000 €/year. Considering 4 pilots for the operation of this particular flight, and keeping in mind its seasonal schedule, the cost of the airplane staff salaries can be computed as follows.

$$\text{Annual aircraft staff salary} = (4 \cdot 187{,}000 + 21 \cdot 37{,}000)\left(1 + \frac{124}{365}\right) = 2{,}043{,}082\ €$$

Moreover, it must be kept in mind that for long-haul flights, crew rotations are required. For this reason, for every flight that operates this route, accommodation and the pertinent meals should be covered for all members of the aircraft staff. Considering an average of 160 € per crew member per flight (including accommodation and meals), and keeping in mind that 652 flights are programmed for the duration of one year, the annual crew rotation cost can be estimated.

$$\text{Annual crew rotation} = 652 \cdot 25 \cdot 160 = 2{,}608{,}000\ €$$

Accordingly, the total annual cost of the airplane staff should be 4,650,000 € approximately.

6.2.2 Fuel cost

The cost of the fuel needed for a flight is one of the major operating costs. This one will vary for each flight according to take-off weight, flight time, cruising altitude, etc., though an indicative value can be taken for a good approximation. An Airbus A380 consumes on average 3 liters of fuel per passenger over 100 km [73]. The price in 2019, which was 0.47 € per liter of Jet A-1 fuel [74], has been selected in order to avoid any effects of the pandemic, as these are not supposed to be long-term. Keeping in mind that the flight path is 13,338 km long and the total number of passengers is 517, the fuel cost for each flight can be computed as follows.

$$\text{Fuel cost per flight} = \frac{13{,}338}{100} \cdot 3 \cdot 517 \cdot 0.47 = 97{,}230 \text{ €}$$

As the total number of programmed flights to operate this route is 652, the annual fuel cost can be expected to be around 63,390,000 €.

6.2.3 Airport fees

Airports set fees for landing, parking, passengers going through the terminal, ground handling, and a few other services. The total sum of all of these makes a considerable flight operating cost, for which reason they will be assessed next.

6.2.3.1 Landing fees

Each airport sets a fee for aircrafts landing at it, which usually depends on the aircraft's maximum take-off weight. Therefore, the maximum take-off weight of an Airbus A380 will be needed, which is 575,000 kg [75].

The landing fee at Hamad International Airport in Doha for any aircraft that has a maximum take-off weight heavier than 136,000 kg is a fixed charge of QR 300 plus an additional QR 14 for every 1,000 kg over that [76]. Therefore, the landing fee for an Airbus A380 can be computed.

$$\text{Landing fee} = 300 + 14\left(\frac{575{,}000 - 136{,}000}{1{,}000}\right) = \text{QR } 6{,}446$$

In this case, the fee for each flight landing in Doha is QR 6,446, which is equivalent to 1,679 €. Considering that 326 flights should land at this airport every year, the annual cost of the landing fee generated by Hamad International Airport should be around 550,000 €.

In the case of Ministro Pistarini International Airport in Buenos Aires, the landing fee for any aircraft operating an international flight and landing inside normal hours should be computed by considering \$ 6.27/tonne for the first 30 tonnes, \$ 7.16/tonne for the following 50 tonnes, \$ 8.81/tonne for every tonne between 81 and 170, and \$ 9.76/tonne for every tonne after that [77]. Therefore, the landing fee for an Airbus A380 should be as follows.

$$\text{Landing fee} = 30 \cdot 6.27 + 50 \cdot 7.16 + 90 \cdot 8.81 + (575 - 170) \cdot 9.76 = \$\ 5{,}292$$

Thus, the fee for each flight landing in Buenos Aires is \$ 5,292, which is equivalent to 5,020 €. Considering that 326 flights should land at this airport every year, the annual cost of the landing fee generated by Ministro Pistarini International Airport should be around 1,640,000 €.

Accordingly, the total annual landing fees for this route should be approximately 2,190,000 €.

6.2.3.2 Parking fees

The parking fee at Hamad International Airport in Doha is 10% of the landing fee for the first 2 hours, but starts to accrue after that [76]. According to the schedule, the aircraft should be parked in Doha for a maximum of 4 hours, so an approximate of a 15% of the landing fee will be considered. Therefore, the annual parking fees at this airport should sum up to around 80,000 €.

In the case of Ministro Pistarini International Airport in Buenos Aires, the parking for any aircraft with a maximum take-off weight heavier than 170 tonnes fee for any aircraft operating an international flight and landing inside normal hours is \$ 1.09 per tonne and hour [77]. According to the schedule, the aircraft should be parked in Buenos Aires for a 2.5 hours. Thus, the parking fee for an Airbus A380 should be as follows.

$$\text{Parking fee} = 1.09 \cdot 2.5 \cdot 575 = \$\ 1{,}567$$

The parking fee per flight \$ 1,567, which is equivalent to 1,487 €. Considering that 326 flights should park at this airport every year, the annual cost of the landing fee generated by Ministro Pistarini International Airport should be around 480,000 €.

Subsequently, the annual parking fees for this route are approximately 560,000 €.

6.2.3.3 Passenger fees

The passenger fee at Hamad International Airport in Doha is QR 40 per passenger for airport development (ADF), and QR 35 for passenger facility (PFC) [76], the number of passengers being those departing. Considering that each flight can carry up to 517 passengers, the passenger fee can be computed.

$$\text{Passenger fee} = (40 + 35) \cdot 517 = \text{QR } 18{,}135$$

The passenger fee at this airport for each flight is QR 18,135, which is equivalent to 4,724 €. Considering that 326 flights should depart from Hamad International Airport every year, the annual passenger cost generated by this airport will be around 1,540,000 €.

The passenger fee at Ministro Pistarini International Airport in Buenos Aires for international flights over 300 km is $ 57 per departing passenger [77]. Considering that each flight can carry up to 517 passengers, the passenger fee can be obtained.

$$\text{Passenger fee} = 57 \cdot 517 = \$\ 29{,}469$$

The passenger fee for each flight is $ 29,469, which is equivalent to 27,946 €. Considering that 326 flights should depart from this airport every year, the annual passenger cost generated by Ministro Pistarini International Airport will be around 9,110,000 €.

Accordingly, the total annual passenger fees for this route sum up to approximately 10,650,000 €.

6.2.3.4 Other charges

Hamad International Airport also charges airlines for bridge mounted equipment (ground power unit and air condition unit) and fixed electrical ground power [76]. The cost per flight of these services is around QR 8,500, which is equivalent to 2,216 €. Therefore, their total annual cost should be approximately 720,000 €.

Ministro Pistarini International Airport charges for security per passenger and boarding bridge per 30 minutes [76]. For every flight, the sum of these fees is estimated to be $ 1,343, which translates to 1,275 €. Thus, their total annual cost should be approximately 420,000 €.

Subsequently, the total annual fees generated by extra services for this route are approximately 1,140,000 €.

6.2.4 Government taxes

Governments usually charge taxes to airlines in addition to airport fees, especially for international flights [64]. However, this is not the case for Qatar, as the only taxes charged are passenger fees, which have already been considered.

On the other hand, though, government taxes in Argentina are extremely high. These are comprised by a PAIS tax of a 30% of the air fare, a DNT (tourist development) tax of a 7% of the air fare, and a recent additional tax of a 35% of the air fare [78]. Therefore, government taxes in Argentina take away a total of a 72% of the airline's income from tickets sold to passengers travelling to Argentina. Although this percentage will be considered for the assembling of the budget, as this way it will be more accurate for the current situation, the IATA has asked the Argentine Government to reconsider these taxes, as they do not contribute to tourism in the country nor the aviation industry in general [78].

6.2.5 Overflight fees

The government of some countries that an airline flies over on its route charges an overflight fee, which covers the use of the country's air traffic control and other navigation services. In some cases this one is a flat fee, while in other cases it depends on the distance travelled [64].

In order to determine the overflight total fee for the specific route between Doha and Buenos Aires, the countries that the aircraft is supposed to fly over have been gathered in Table 6.1, along with their respective overflight fees.

Table 6.1: Overflight fees.

Country	Overflight fee	Actual cost [€]
Saudi Arabia	100 SAR [79]	25
Sudan	2700 CHF [80]	2,630
South Sudan	None [81]	0
Central African Republic	72 €[82]	72
Cameroon	None [83]	0
Republic of the Congo	None [84]	0
Gabon	$ 275 [85]	261
Uruguay	None [86]	0
Total		**2,988**

As can be observed, the total overflight fee for the operation of this route is 2,988 € per flight, which translates to an annual cost of approximately 1,950,000 €.

6.3 Budget

From all the costs estimated in the previous section for the operation of this route, including fixed costs and flight operating costs, the economic results of the implementation of this route can be estimated.

6.3.1 Air fares

Given the fact that the cost associated to government taxes depends on the air fares, these need to be established first. In order to do so, the fare for the current alternatives was looked up: the current cheapest fare for the next year, regardless of flight time and other aspects, is 1,583 € for a roundtrip [87]. From this value, and by determining that business class should be around a 125% higher than the economy, and first class around a 500% higher, the average selling prices for this route were determined to be as noted in Table 6.2. It must be mentioned that these are all annual average selling prices: they could vary between high and low season, or even for the same flight, depending on time of purchase, additional services booked, etc.

Table 6.2: Air fares for this route.

Class	Average ticket selling price [€]	Capacity	Income per flight [€]
Economy	575	461	265,075
Business	1,294	48	62,112
First	3,450	8	27,600
Total		**517**	**354,787**

Keeping in mind that this route has been designed to operate 652 flights per year, the total annual income it generates to the airline should be around 231,321,124 €.

As can be seen, the average air fare for economy class is 575 € for each flight, which translates to 1,150 € for the roundtrip. This value is considerably lower than the one offered by the current alternatives, making this option even more appealing for customers.

6.3.2 Annual expenses

Gathering all together the costs previously computed, the expenses for each accounting period should be as depicted in Table 6.3. They have also been graphically displayed in a pie chart, which can be found in Figure 6.1.

Table 6.3: Budget for expected expenses during an accounting period of one year.

Fixed costs	**35,050,000 €**
Aircraft amortization	25,120,000 €
Aircraft maintenance	8,670,000 €
Aircraft amortization	820,000 €
Staff and management	440,000 €
Flight operating costs	**167,802,788 €**
Staff (pilot and cabin crew)	4,650,000 €
Fuel	63,390,000 €
Airport fees	14,540,000 €
Government taxes	83,272,788 €
Overflight fees	1,950,000 €
Total costs	**202,852,788 €**

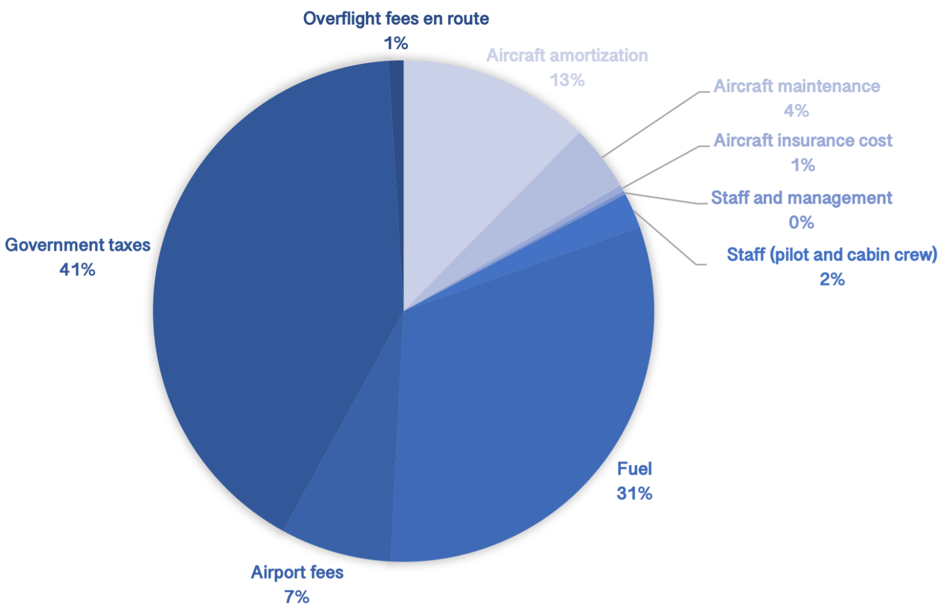


Figure 6.1: Annual costs distribution.

Attention must be called to the fact that government taxes are the largest cost that the route will face during its operation, due to the extremely high taxes set by the Argentine Government. However, as was mentioned in the respective section, these taxes could be lowered in the near future, which would cause a very noticeable decrease in the airline's expenses generated by this route, which would result in an even higher profitability.

Although the total annual expenses to be accounted for are accurately noted in Table 6.3, they should not be understood as an actual disbursement of funds. This is because the disbursement for the purchase of the aircrafts will take place at the initial point in time, therefore their amortization is not a recurring payment. Although the second aircraft is also fully paid at this moment, its cost will only be attributed to this particular route for the time period that it is supposed to operate it. Therefore, the cost of the initial investment can be computed as follows.

$$\text{Initial investment} = 225{,}000{,}000 \left(1 + \frac{124}{365}\right) = 301{,}438{,}356 \text{ €}$$

On the same note, the actual annual expenditures of the airline generated by this route are 177,732,788 €.

6.3.3 Cash flows

From all the previously obtained values, the annual cash flows can be computed.

In order to account for the depreciation of the currency's value, a discount rate of a 7% will be considered for the calculation of future cash flows, obtaining thusly the discounted cash flow by using equation 6.1.

$$DCF = \frac{CF_t}{(1 + k_t)^t} \tag{6.1}$$

Values for the first 10 years for all cash flows have been gathered in Table 6.4, along with their respective cumulative cash flows.

As can be easily observed, both the cumulative cash flow and discounted cash flow should be largely positive after 10 years. However, in order to assess if these results are beneficial enough to consider the launch of this route economically feasible, some economic parameters should be computed and interpreted first.

Table 6.4: Cash flows (in euros) generated by this route.

Year	Income	Expenses	CF	DCF	Cumulative CF	Cumulative DCF
0	0	-301,438,356	-301,438,356	-301,438,356	-301,438,356	-301,438,356
1	231,321,124	-177,732,788	53,588,336	50,082,557	-247,850,020	-251,355,799
2	231,321,124	-177,732,788	53,588,336	46,806,128	-194,261,684	-204,549,671
3	231,321,124	-177,732,788	53,588,336	43,744,045	-140,673,348	-160,805,626
4	231,321,124	-177,732,788	53,588,336	40,882,285	-87,085,012	-119,923,341
5	231,321,124	-177,732,788	53,588,336	38,207,743	-33,496,676	-81,715,598
6	231,321,124	-177,732,788	53,588,336	35,708,171	20,091,660	-46,007,427
7	231,321,124	-177,732,788	53,588,336	33,372,122	73,679,996	-12,635,305
8	231,321,124	-177,732,788	53,588,336	31,188,899	127,268,332	18,553,595
9	231,321,124	-177,732,788	53,588,336	29,148,504	180,856,668	47,702,099
10	231,321,124	-177,732,788	53,588,336	27,241,593	234,445,004	74,943,692

6.4 Economic parameters

Economic parameters are a very useful tool to determine the economic feasibility of a potential investment. For this reason, the economic analysis should not stay in the determination of a budget and the estimated cash flows for the following few years, as the determination and interpretation of several economic parameters might be more indicative in order to draw a reasoned conclusion.

6.4.1 Break-even point (BEP)

The first parameter that will be assessed is the break-even point (BEP). Although this parameter is usually measured in units, for the case in point it is more convenient to measure it in percentage of occupancy of the planned flights. Moreover, in this case the variable costs depend on the number of flights carried out, rather than their occupancy. Therefore, equation 6.2 will be applied.

$$\text{BEP (occupancy rate)} = \frac{\text{fixed costs} + \text{variable costs}}{\text{income per flight} \cdot \text{number of flights}} \tag{6.2}$$

Note that the costs associated to a particular route operated by an airline that has a wide range of destinations can all be considered variable, especially for the launch of a new route, as they would not be faced if the route did not operate.

In this case, the total annual costs that the airline will need to face for the operation of this route are 202,852,788 €, as was obtained in Table 6.3. Moreover, the income per flight was calculated in Table 6.2, resulting in 354,787 €, and the number of annual flights was set to 652. Therefore, the occupancy rate can be easily obtained as follows.

$$\text{BEP (occupancy rate)} = \frac{202{,}852{,}788}{354{,}787 \cdot 652} = 0.88$$

Accordingly, the beak-even point, measured in percentage of occupancy rate, is 88%. This should be a very obtainable average occupancy rate, given that the actual frequency of the flight was planned to be considerably lower than that obtained from the demand. Moreover, this occupancy rate does not distinguish between the three offered classes for the flight, while the occupancy rate of first and business classes is usually higher than economy, possibly increasing the income per flight for one specific occupancy rate.

6.4.2 Payback period (SPP and DPP)

Another relevant economic parameter to consider is the payback period. This one can be simple (SPP), if regular cash flows are considered, or discounted (DPP), if discounted cash flows are considered. From equation 6.3 it can be deduced that, for the computation of either of them, the initial investment will be needed, which was previously found to be 301,438,356 €.

$$\text{PP} = \frac{\text{initial investment}}{\text{average annual cash flow}} \tag{6.3}$$

However, there is another more precise way to obtain the payback period. By looking into Table 6.4, it can be observed that the SPP should be during the sixth year, whereas the DPP should be during the eighth. Therefore, they both can be computed as follows.

$$SPP = 5 + \frac{|CF_0| - CF_1 - CF_2 - CF_3 - CF_4 - CF_5}{CF_6}$$
$$DPP = 7 + \frac{|CF_0| - DCF_1 - DCF_2 - DCF_3 - DCF_4 - DCF_5 - DCF_6 - DCF_7}{DCF_8}$$

By substituting the respective values, which can all be found in Table 6.4, an SPP of 5.63 years and a DPP of 7.41 years were obtained. Accordingly, it is safe to assert that the amount of the initial investment should be returned in less than six years, whereas the value of the initial investment should be returned in approximately seven and a half years.

6.4.3 Net present value (NPV)

The last economic factor that was found to be relevant for the case in point and therefore will be assessed is the net present value (NPV). This factor expresses the actual value of an investment at a certain moment, representing the difference between the cash inflows and the value of the cash outflows over a period of time. Equation 6.4 can be used for its estimation, where CF_0 is the initial investment.

$$NPV = -CF_0 + \sum_{t=1}^{n} \frac{CF_t}{(1 + k_t)^t} \tag{6.4}$$

As can be observed, the term inside the summation is the discounted cash flow (see equation 6.1), hence its summation serves as the cumulative discounted cash flow at a certain point in time (not accounting for the initial investment). However, as this one is separately subtracted, the NPV at each point in time will be equal to the cumulative discounted cash flow noted in Table 6.4.

Therefore, after 10 years, the NPV should be 74,943,692 €, which represents a 25% of the initial investment.

As a summary, Table 6.5 was compiled, with all the obtained results for the economic parameters.

Table 6.5: Summary of the economic parameters.

Break-even point (BEP)	88% of occupancy rate
Simple payback period (SPP)	5.63 years
Discounted payback period (DPP)	7.41 years
Net present value (NPV) after 10 years	25% of initial investment

Chapter 7

Impact evaluation

The purpose of this chapter is to analyse the overall impact that the launch of this new transatlantic route between Doha and Buenos Aires would have. In order to do so, the evaluation has been divided into economic, social, and environmental impacts.

7.1 Economic impact

The air transport industry has a huge economic impact on several industries. This one can be divided into three main categories: direct, which is the impact within the industry; indirect and induced, which are the impacts on industries from the supply chain or others that these affect; or catalytic effects, which refer to the impact on other industries [88].

First, the launch of the route would increase employment and activity throughout the air transport industry: manufacturers of aircrafts and components, operations in Qatar Airways and at the airports associated to this particular route, maintenance of the aircrafts, air traffic control and regulation, check-in activities, baggage-handling, on-site retail, and catering facilities [88].

Moreover, employment and activity in supplier industries would also be increased, as the launch of this new route would require additional provisions from several companies, likely causing these to invest in more workers and a rise in their income. The same could happen to other industries as a result of the induced economic impact, which would take place as the route's passengers spend money on companies whose activity is related to food, beverages, recreation, and leisure at the airport, or transport, among others [88].

Finally, it is safe to expect a series of catalytic effects from this route, especially an increase in trade between Qatar and Argentina and a potential boost in tourism in all listed countries in Table 4.1. This is certainly the major effect that would contribute to the world economy by and large, facilitating the growth of several other industries through its catalytic impacts [88].

7.2 Social impact

Although the real social impact of this route is far more difficult to quantify, it is safe to assert that the air transport industry contributes to people's quality of life and welfare, allowing them to travel around the world, meet new cultures, and generally have access to other regions of the planet. Through this, a better international integration can be achieved, especially with transoceanic routes such as this one, which connect very culturally different parts of the world [88].

Furthermore, this particular route would undoubtedly support sustainable development of the countries listed in Table 4.1, as it would promote their economic growth, reducing their poverty indicators as a result. Likewise, as tourism in South America and some countries of the Middle East and Asia is largely nature-based, an increase of this kind of tourism would encourage a higher preservation of nature and protected areas by the governments involved, which is definitely a social advantage of launching this route [88].

7.3 Environmental impact

As was previously computed in the corresponding section, around 0.49 million passengers would turn over their demand from the existing route between Doha and São Paulo to the new one being launched. Therefore, it is safe to deduce that 1,189 flights operating this route would be cancelled annually. Moreover, the frequency of flights between São Paulo and Buenos Aires would also be reduced, possibly around a 5%, which is equivalent 240 flights annually.

Each flight between Doha and São Paulo emits approximately 418,310.6 kg of CO_2, while each flight between São Paulo and Buenos Aires emits around 66,691.3 kg of CO_2 [89]. Therefore, the cancellation of all previously mentioned routes results in an approximate emission reduction of 513 million kilograms of CO_2 annually.

However, in order to quantify the new route's environmental impact, the emissions of this one need to be computed. The Airbus A380 is one of the most environmentally friendly aircrafts ever built, and is actually one of the only to have performed a flight powered by 100% Sustainable Aviation Fuel (SAF) [90]. By knowing that this aircraft emits about 101 grams of CO_2 per passenger per kilometer when operating at 80% capacity [91], the emissions per flight of this route can be rounded to a total of 557,000 kg, resulting in 363 million kilograms of CO_2 annually.

As can be easily observed, the emission of CO_2 attributed to the new route should be lower than that emitted by the existing alternatives, which would be cancelled in the scenario of the actual launch. What is more, in that case, CO_2 emissions would be experiencing a 29% reduction. Therefore, it can be deduced that a direct route between Doha and Buenos Aires is much more environmentally friendly than keeping the existing alternatives, for which is concluded that the environmental impact of the launch of the new route is significantly positive.

Chapter 8

Conclusions

The thorough study carried out had the purpose of determining the feasibility of launching a new transatlantic air route between Doha and Buenos Aires by Qatar Airways. This could be done by assessing the layers of the business operating environment, which are the macro-environment, the sector, and the market. Moreover, once these were estimated, the elements of the organisation could be decided in order to make the route the most adequate to the needs of the affected environment.

With an emphasis on the last two sections, the feasibility of the new route could be ascertained by comparing the obtained results with the requirements initially stated for this route to be considered feasible, which have all been gathered in Table 8.1. As can be easily observed, all requirements have been adequately met with the exception of one, which will be discussed next.

Travel time has been exceptionally reduced with the new route, along with CO_2 emissions, which have proven to have greater results than anticipated. Moreover, the result obtained for the simple payback time is in accordance with the respective requirement as well, in addition to the net present value after 10 years, which was also found to be convenient. However, the occupancy rate of the break even point

Table 8.1: Comparison between initial requirements and actual results.

Decrease the current total travel time by at least 3 hours.	The new route decreases the total travel time by approximately 5 hours and 25 minutes from the current shortest alternative.
Have a break even point of an average of 80% or lower of the capacity of the airplane.	The break even point of the route is an average of 88% of occupancy rate.
Have a simple payback period of 6 years or less.	The new route has a simple payback period of 5.63 years.
Have a positive net present value of a 20% of the initial investment after 10 years.	The net present value of the route after 10 years is 25% of the initial investment.
Reduce CO_2 emissions by at least a 20% with respect to the current route.	The new route reduces CO_2 emissions by a 29% with respect to the current route.

has been found to be greater than desired, which based on theory is not favourable.

Nonetheless, it must be kept in mind that this requirement is strictly related to the economic feasibility of the route. As was previously mentioned in the corresponding section, the greatest contributor to the airline's expenses are the Argentine Government taxes, which should be lowered in the near future by virtue of the petition formulated by the IATA. Therefore, the expenses of this route could be majorly reduced eventually, which would drastically improve economic results. In addition, the designed frequency of this route was determined to be a 38% lower than that obtained theoretically from the demand, meaning that the occupancy rate should be higher than average, likely reaching the whole on many occasions. Moreover, the ticket selling price could be increased to compensate any lack in occupancy, as there is a considerable margin here, given that determined prices are quite low in comparison to current alternatives.

All in all, the launch of the transoceanic air route between Doha and Buenos Aires can be considered feasible. However, it is true that it might be more economically convenient for Qatar Airways to do so in the near future, when the Argentine Government taxes are lowered.

Appendix A

Qatar Airways’ previous incidents and accidents

Table A.1: Qatar Airways’ previous incidents [92].

Year	Aircraft	From	To	Incident
2012	A332	Copenhaguen, Denmark	Doha, Qatar	Door open indication
2012	A333	Doha, Qatar	Lagos, Nigeria	Flat tyre before landing
2012	B772	Frankfurt, Germany	Doha, Qatar	Engine shut down in flight
2012	B788	Victorville, California	Doha, Qatar	Generator failure
2013	A321	Doha, Qatar	Budapest, Hungary	Engine shut down in flight
2013	B773	Doha, Qatar	New York, New York	Could not retract flaps
2013	A333	Tunis, Tunisia	Doha, Qatar	Engine problems
2014	A333	Doha, Qatar	London, United Kingdom	Smoke in cabin
2014	B788	Johannesburg, South Africa	Doha, Qatar	Gear problem on departure

Year	Aircraft	From	To	Incident
2014	B788	Brussels, Belgium	Doha, Qatar	Technical problem
2014	A333	Doha, Qatar	Manchester, United Kingdom	Possible device on board turns out as hoax threat
2014	B788	Doha, Qatar	Copenhaguen, Denmark	Engine problems
2014	B773	Doha, Qatar	Perth, Australia	Fuel issue
2014	A320	Doha, Qatar	Muscat, Oman	Burning smell in cabin
2014	B788	Doha, Qatar	Edinburgh, United Kingdom	Lightning strike
2015	B788	Doha, Qatar	Munich, Germany	Flock of birds
2015	A332	Jakarta, Indonesia	Doha, Qatar	Rejected takeoff
2015	A359	New York, New York	Doha, Qatar	Rejected takeoff
2016	A333	Doha, Qatar	Lahore, Pakistan	Bird strike
2016	B788	Oslo, Norway	Doha, Qatar	Engine shut down in flight
2016	A333	Istanbul, Turkey	Doha, Qatar	Bird strike
2016	A332	Doha, Qatar	Dammam, Saudi Arabia	Hydraulic leak
2016	B788	Johannesburg, South Africa	Durban, South Africa	Bird strike
2016	A333	Doha, Qatar	Barcelona, Spain	Suspected fuel leak
2016	B788	Hong Kong, China	Doha, Qatar	Cracked windshield
2017	A333	Berlin, Germany	Doha, Qatar	Could not retract landing gear
2017	B788	Phuket, Thailand	Doha, Qatar	Fire on board
2017	B773	Miami, Florida	Doha, Qatar	Smoke on the flight deck
2017	B788	Doha, Qatar	Denpasar, Indonesia	First officer incapacitated
2017	A321	Thiruvananthapuram, India	Doha, Qatar	Captain falls ill

Year	Aircraft	From	To	Incident
2017	A359	Doha, Qatar	Munich, Germany	Hydraulic failure
2018	B788	Krabi, Thailand	Doha, Qatar	Loss of separation
2018	A333	Doha, Qatar	Tunis, Tunisia	Engine problem
2018	A333	Doha, Qatar	Kochi, India	Temporary runway excursion
2018	B788	Addis Ababa, Ethiopia	Doha, Qatar	Burning odour on board
2018	A320	Peshawar, Pakistan	Doha, Qatar	Smoke in cabin
2018	B773	Dhaka, Bangladesh	Doha, Qatar	Could not fully retract gear
2018	A320	Doha, Qatar	Helsinki, Finland	Technical problem
2018	B788	Manchester, United Kingdom	Doha, Qatar	Engine fire indication
2019	A359	Doha, Qatar	Nairobi, Kenya	Engine shut down in flight
2019	B772	Doha, Qatar	Auckland, New Zealand	Engine problem on departure
2019	A332	Doha, Qatar	Islamabad, Pakistan	Engine shut down in flight
2020	B788	Doha, Qatar	Oslo, Norway	Engine shut down in flight
2020	A388	Melbourne, Australia	Doha, Qatar	Could not retract landing gear
2020	A332	Sialkot, Pakistan	Doha, Qatar	Loss of cabin pressure
2020	B772	Doha, Qatar	Los Angeles, California	Bird strike
2020	B773	Doha, Qatar	Tunis, Tunisia	Bird strike
2020	B748	Frankfurt, Germany	Doha, Qatar	Hydraulic leak
2021	B773	Doha, Qatar	Bangkok, Thailand	Tyre damage on departure
2021	A35K	Doha, Qatar	Washington, D.C.	Rejected takeoff due to engine overheat
2021	B772	Male, Maldives	Doha, Qatar	Cracked windshield

Year	Aircraft	From	To	Incident
2021	B772	Panama City, Panama	Maastricht, Netherlands	Bird strike
2021	A359	Hong Kong, China	Doha, Qatar	Engine shut down in flight
2021	B773	Auckland, New Zealand	Brisbane, Australia	Temporary runway excursion on landing

Table A.2: Qatar Airways' previous accidents [92].

Year	Aircraft	From	To	Incident
2014	A320	Doha, Qatar	Warsaw, Poland	Turbulence injures flight attendant
2015	B773	Doha, Qatar	Manila, Philippines	Clear air turbulence injures 5
2016	B773	Miami, Florida	Doha, Qatar	Overran runway on takeoff run and struck approach lights on departure
2017	A321	-	-	Aircraft on fire during maintenance
2020	B773	Washington, D.C.	Doha, Qatar	Turbulence causes 4 injuries

Appendix B

Exchanged tourists between South America and the Middle East and Asia

Table B.1: Non-resident arrivals at affected countries (2019) [93].

Country A	Region of country B	Country B	Non-resident arrivals (2019)		Total
			From A to B	From B to A	
Argentina	Middle East	Other countries in eastern Middle East	38,808	5,424	44,232
	Asia	China	30,598	76,452	107,050
		India	12,844	9,782	22,626
		Indonesia	9,994	1,356	11,350
		Japan	23,805	25,009	48,814
		Malaysia	7,750	3,133	10,883
		Philippines	3,643	2,974	6,617
		Singapore	23,685	2,901	26,586
		South Korea	5,153	33,798	38,951
		Thailand	29,498	2,308	31,806
		Other countries in southern Asia	25,535	8,942	34,478
		TOTAL	**211,313**	**172,079**	**383,393**
Bolivia	Middle East	Other countries in eastern Middle East	4,452	5,475	9,927
	Asia	Japan	1,020	12,980	14,000
		Other countries in southern Asia	60,841	36,057	96,898
		TOTAL	**66,313**	**54,512**	**120,825**

APPENDIX B. EXCHANGED TOURISTS BETWEEN SOUTH AMERICA AND THE MIDDLE EAST AND ASIA

Country A	Region of country B	Country B	Non-resident arrivals (2019)		Total
			From A to B	From B to A	
Brazil	Middle East	Iran	1,981	1,512	3,493
		Saudi Arabia	3,705	1,378	5,083
		Other countries in eastern Middle East	118,707		118,707
	Asia	Bangladesh		600	600
		China	127,631	72,828	200,459
		India	25,422	16,958	42,380
		Indonesia	30,232	3,934	34,166
		Japan	47,575	78,914	126,489
		Malaysia	14,220	3,301	17,521
		Pakistan		1,071	1,071
		Philippines	10,035	6,718	16,753
		Singapore	14,211	4,264	18,475
		South Korea	23,788	39,321	63,109
		Taiwan	5,417	4,721	10,138
		Thailand	69,714	4,025	73,739
		Other countries in southern Asia	34,473	134	34,607
		TOTAL	**527,111**	**239,679**	**766,789**
Chile	Middle East	Bahrain	139	25	164
		Iran	169	201	370
		Iraq		14	14
		Kuwait	168	88	256
		Oman		20	20
		Qatar	6,489	16	6,505
		Saudi Arabia	359	113	472
		United Arab Emirates	9,728	242	9,970
		Yemen	285	7	292
	Asia	Afghanistan		135	135
		Bangladesh		59	59
		Bhutan	103	20	123
		Brunei		57	57
		Cambodia	6,611	19	6,630
		China	25,920	36,170	62,090
		India	6,446	5,563	12,009
		Indonesia	10,029	1,307	11,336
		Japan	13,370	16,691	30,061
		Kazakhstan	265	106	371
		Laos	1,547	5	1,552
		Malaysia	4,568	1,965	6,533
		Maldives	757	13	770
		Mongolia	193	86	279

Country A	Region of country B	Country B	Non-resident arrivals (2019)		Total
			From A to B	From B to A	
Chile	Asia	Myanmar	1,841	30	1,871
		Nepal		54	54
		Pakistan		258	258
		Philippines		867	867
		Singapore	17,053	2,189	19,242
		South Korea	5,944	19,975	25,919
		Sri Lanka	576	45	621
		Taiwan	2,487	4,440	6,927
		Thailand		1,671	1,671
		Turkmenistan		16	16
		Uzbekistan	144	10	154
		Vietnam	6,165	1,252	7,417
		Other countries in southern Asia		61,357	61,357
	TOTAL		**121,355**	**155,086**	**276,441**
Paraguay	Middle East	Iran		10	10
		Iraq		4	4
		Kuwait	34	5	39
		Oman		9	9
		Qatar	721	6	727
		Saudi Arabia	73	4	77
		United Arab Emirates	1,446	86	1,532
		Other countries in eastern Middle East	182		182
	Asia	Afghanistan		230	230
		Bangladesh		26	26
		Brunei		18	18
		Cambodia		7	7
		China	1,404	661	2,065
		India	393	269	662
		Indonesia	287	25	312
		Japan	675	3,349	4,024
		Kazakhstan	14	14	28
		Laos	172	1	173
		Malaysia	175	42	217
		Mongolia	5	6	11
		Pakistan		31	31
		Philippines		57	57
		Singapore	9,474	60	9,534
		South Korea	644	3,814	4,458
		Sri Lanka	320	6	326
		Taiwan	1,382	776	2,158

APPENDIX B. EXCHANGED TOURISTS BETWEEN SOUTH AMERICA AND THE MIDDLE EAST AND ASIA

Country A	Region of country B	Country B	Non-resident arrivals (2019)		Total
			From A to B	From B to A	
Paraguay	Asia	Thailand		34	34
		Timor-Leste		1	1
		Uzbekistan	10	5	15
		Vietnam	3,425	10	3,435
		Other countries in southern Asia	1,157	16	1,173
		TOTAL	**21,992**	**9,582**	**31,574**
Uruguay	Middle East	Other countries in eastern Middle East	3,767	1,973	5,741
	Asia	Japan	2,475	2,877	5,352
		Other countries in southern Asia	15,731	7,424	23,155
		TOTAL	**21,974**	**12,274**	**34,248**
Total number of tourists exchanged					**1,613,270**

Appendix C

Flight time computation codes

```
%% FLIGHT TIME
clc; clear all; close all;

Dist_total = 13338 ;                                    % km
Altitude_Cruise = 35000 ;                               % ft

%% CLIMB
RO_C = [1500; 2500; 1300; 1000] ;                       % ft/min
FL_C = [5000; 15000; 24000; Altitude_Cruise] ;          % ft
Mach_C = 0.83 ;
IAS_C = [190; 240; 240];                                % kts

% Climb time and distance computation
condition = 0 ;
[TAS_C,H_C] = TAS(IAS_C,FL_C,Mach_C,condition) ;        % km/h
TimeC = Time(H_C,RO_C) ;                                % h
Dist_C = Dist(TAS_C,TimeC) ;                            % km
Time_C = sum(TimeC) ;                                   % h

%% DESCENT
RO_D = [1000; 2000; 1000] ;                             % ft/min
FL_D = [Altitude_Cruise; 24000; 10000; 0] ;             % ft
Mach_D = 0.83 ;
IAS_D = [300; 250];                                     % kts

% Descent time and distance computation
condition = 1 ;
[TAS_D,H_D] = TAS(IAS_D,FL_D,Mach_D,condition) ;        % km/h
TimeD = Time(H_D,RO_D) ;                                % h
```

```
Dist_D = Dist(TAS_D,TimeD) ;                                % km
Time_D = sum(TimeD) ;                                       % h

%% CRUISE
Mach_Cruise = 0.85 ;
Dist_Cruise = Dist_total-Dist_C-Dist_D ;                    % km
TAS_Cruise = TAS_Cruise(Altitude_Cruise,Mach_Cruise) ;      % km/h
Time_Cruise = Dist_Cruise/TAS_Cruise;                       % h
TimeCruise = [Time_C; Time_C+Time_Cruise] ;                 % h

%% TOTAL TIME
Time = Time_C+Time_Cruise+Time_D ;                          % h
hours = fix(Time) ;                                         % h
minutes = (Time-hours)*60 ;                                 % min
R = ['Total flight time is ',num2str(hours),' hours and ',num2str(round
    (minutes)),' minutes.'] ;
disp(R)
```

```
function [TAS,H] = TAS(IAS,FL,Mach,condition)

H = zeros(size(IAS)) ;
TAS = zeros(size(IAS)) ;

% CLIMB
if condition == 0
    H(1) = FL(1) ;
    for i = 2:size(FL)
        H(i) = FL(i)-FL(i-1) ;
    end
    % TAS from IAS
    for i = 1:size(IAS,1)
        TASm = sparse(H(i),1) ;
        k = 1 ;
        for j = FL(i)-H(i)+1:FL(i)
            TASm(k) = IAS(i)*(1+0.02*j/1000) ;
            k = k+1;
        end
        TAS(i) = sum(TASm)/H(i)*1.852 ;
    end
    % TAS from Mach
    H_Mach = H(size(FL,1)) ;
    FL_Mach = FL(size(FL,1)) ;
    k = 1;
    for i = FL_Mach-H_Mach+1:FL_Mach
        i = i/3.28084 ;
        T(k) = 288.15-6.5*i/1000 ;
```

```
        c(k) = 331+0.6*(T(k)-273.15) ;
        k = k+1 ;
    end
    c = sum(c)/H_Mach ;
    TAS_Mach = Mach*c*3.6 ;
    % General TAS
    TAS = [TAS; TAS_Mach] ;
end

% DESCENT
if condition == 1
    for i = 1:size(FL)-1
        H(i) = FL(i)-FL(i+1) ;
    end
    % TAS from IAS
    for i = 1:size(IAS,1)
        TASm = sparse(H(i),1) ;
        k = 1 ;
        for j = FL(i):-1:FL(i)-H(i)+1
            TASm(k) = IAS(i)*(1+0.02*j/1000) ;
            k = k+1;
        end
        TAS(i) = sum(TASm)/H(i)*1.852 ;
    end
    % TAS from Mach
    H_Mach = H(1) ;
    FL_Mach = FL(1) ;
    k = 1;
    for i = FL_Mach:-1:FL_Mach-H_Mach+1
        i = i/3.28084 ;
        T(k) = 288.15-6.5*i/1000 ;
        c(k) = 331+0.6*(T(k)-273.15) ;
        k = k+1 ;
    end
    c = sum(c)/H_Mach ;
    TAS_Mach = Mach*c*3.6 ;
    % General TAS
    TAS = [TAS_Mach; TAS] ;
end

end
```

```
function Time = Time(H,RO)

Time = zeros(size(H,1),1) ;
for i = 1:size(H,1)
```

```
    Time(i) = H(i)/RO(i) ;  % min
end
Time = Time/60 ;            % h

end
```

```
function Dist = Dist(TAS,Time)

Dist = zeros(size(TAS,1),1) ;
for i = 1:size(TAS,1)
    Dist(i) = TAS(i)*Time(i) ;  % km
end
Dist = sum(Dist) ;              % km

end
```

```
function TAS_Cruise = TAS_Cruise(altitude,Mach)

% CRUISE
z = altitude/3.28084 ;        % m
T = 288.15-6.5*z/1000 ;       % K
c = 331+0.6*(T-273.15) ;      % m/s
TAS_Cruise = Mach*c*3.6 ;     % km/h

end
```

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