# A framework for change in air transport applied to the Gulf carriers

Jan Pieter BUIJS

### Abstract

Air transport is a very volatile industry, prone to many endogenous and exogenous influences. One of the recent influences is the rise of the Gulf carriers, posing an alleged threat to the position of legacy carriers. This paper will explore the dynamics of air transport by studying the underlying system structure. This results in a framework with key concepts, helping to assess changes, like the impact of the Gulf carriers. Applying this framework to the rise of the Gulf carriers, it is likely they will obtain a position in the system, but they will not incur system changes.

*Keywords: change assessment framework, cyclic system behaviour, grounded theory, gulf carriers, resilience threshold, sub systems of air transport*

## Introduction

Doganis (2009) describes the air transport industry as paradoxical: it is characterised by rapid developments and growth, yet the margins and yields are limited. Many new airlines emerge, while others merge or cease operations. Doganis (2009) also explains this volatile environment is the result of system features, like the high capital demands and strong competition. Thereby air transport has an important role in economic development and social inclusion, as Smyth, Christodoulou, Dennis, Marwan, and Campbell (2012) state, leading to government interference. Along with state-aid and national (interests of) airlines the system is very non-transparent, with complex relations, making it hard to foresee the future.

One of the trends in the air transport system is the rise of the Gulf carriers. The airlines Emirates, Etihad Airways and Qatar Airways from the Arab peninsula, which were non-existent until a decade ago, have developed into worldwide key players (Hooper, Walker, Moore, & Al Zubaidi, 2011; O'Connell, 2011; "Super-duper-connectors from the Gulf," 2010). This resulted in legacy airlines worldwide raising the issue of a level playing field: they fear oppression by unfair competition of Gulf carriers with state-aid (De Wit, 2014).

Many researchers have dealt with this issue. Conclusions vary, as often a specific segment of the system is researched. Vespermann, Wald, and Gleich (2008) recognise the threat for primary airports with airline hubs, when demand drops below a critical mass, while secondary airports profit of increased passenger numbers and direct intercontinental connections. Lohmann, Albers, Koch, and Pavlovich (2009) list some advantages of Emirates, one of the Gulf carriers, including costs advantages over legacy airlines and the fact airport and airline owner and the regional air transport regulator are related. Murel and O'Connell (2011) notice the similarities between the Gulf carriers and KLM, all being highly dependent of transfer passengers due to a small local catchment area. O'Connell (2011) lists Emirates' competencies, including cost advantages and its geographical location. Also some research is focussed on a specific region, especially Germany due to the strong anti Gulf carrier lobby of Lufthansa

(Forsyth, 2014; Grimme et al., 2012; Lufthansa Group, 2015; Mandel & Schnell, 2001). The Dutch situation is less well-researched, although Burghouwt (2012) and Lieshout (2012) make an empirical start with comparing KLM with the Gulf carriers, but to not focus of the system impact.

This research will have a more qualitative system approach, combining existing research into a framework for assessing this trend of the three growing Gulf carriers. Therefore this research will have a more abstract perspective, focussing on the underlying question:

**How can systemic changes in air transport be assessed?**

This research will combine literature to draft a framework for assessment of changes in air transport. To do so the first step is to establish a view on the system behaviour of air transport, to better understand the dynamics in this system. Thereafter will be explored which different kinds of change do exist in a system, based on their effects. This is a starting point for the last question, connecting the system and theory on system changes, to expose the presence of change in air transport. All steps are reflected in the following sub questions:

1. How can the cyclic behaviour of air transport be explained?
2. How can the influences of the air transport system be categorised?
3. How are the different types of change present in the air transport system?

Following these steps a form of grounded theory is used, as described by Corbin and Strauss (1990). First the interrelated processes are analysed, followed by determining the unit of analysis. Then a categorisation is introduced, followed by theoretical grounds to establish "concepts, their properties, dimensions, and variations" (Corbin & Strauss, 1990, p. 8). Also behavioural patterns are accounted for. Together this leads to a case specific theoretical framework, which into a certain extend also can be used for other influences in air transport.

## System behaviour of air transport

System output is the result of the internal behaviour. Whereas output is often clear, because it can easily be made operational, the internal processes are often hidden is a sort of black box. To better understand the behaviour of the system output, this section will focus on the inner structure of the system, as Rosenberg (1982) suggested, to help solve economic problems. To help better frame the system behaviour, the system will be assumed to be cyclic. Limited research is available on this topic, although some authors (like Jiang & Hansman, 2004; Liehr, Größler, Klein, & Milling, 2001; Pierson & Sterman, 2013) have proven cyclic elements in the system. This will be done with the question "*How can the cyclic behaviour of air transport be explained?*".

A system exists of multiple connected sub systems. Due to the interconnectedness, a cyclical output will be caused by one or more cyclical sub systems. To assess the system behaviour of air transport, Buijs (2015) identifies revenue passenger kilometres (RPK) as most including and neutral indicator for the performance of passenger airlines.

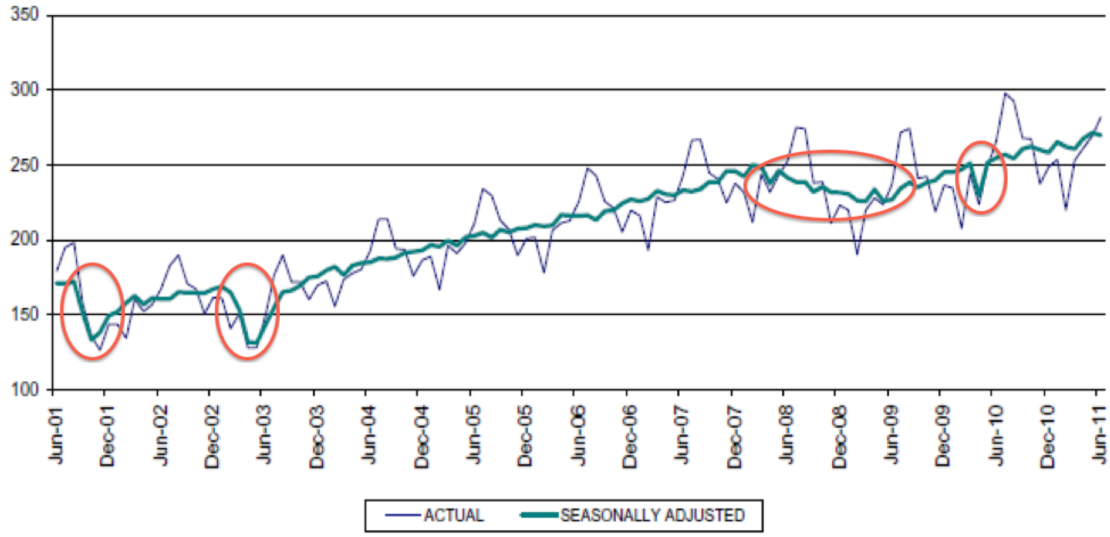


**Figure 1 Billion revenue passenger kilometres (RPK) for international scheduled passenger traffic per month, from June 2001 to June 2011, industry total. From (Brauer & Dunne, 2012)**

In Figure 1 an example of the systems' RPK is provided. The exact values and measured system are less relevant, as this paper is focussing on the (rough) behaviour. Observing Figure 1, two lines are drafted: actual RPK, and seasonally adjusted RPK. Air transport tends to have an annually repeating pattern with high-season peaks (the Northern hemisphere's summer and during Christmas time) and low-season troughs (Brauer & Dunne, 2012). By filtering out this short-term cyclic behaviour, the long-term trends become visible. This adjusted line shows four troughs, indicated by the red circles.

According to Pierson and Sterman (2013) these troughs are caused by exogenous events: wars, pandemics and economic crises. These events caused a worldwide drop in demand of air transport. But soon after the drop a recovery is visible; the RPK figure is more or less comparable with a pre-crash level.

To better understand this behaviour, the analysis into the underlying structure must be made a step deeper. Figure 2 displays how the components demand and supply (capacity) of air transport are balanced. Pierson and Sterman (2013) explain how cyclic behaviour is caused by the delay in feedback loops in their model.

While Pierson & Sterman's model can be used to explain the root of cyclic behaviour, it is also interesting as it gives an insight into the affected factors by exogenous influences: demand & costs – directly and indirectly via wages. On the other hand a system is also prone to endogenous influences. These can occur at the capacity (including orders), costs (including salaries), demand (which is partly induced by availability) and prices factors, as those factors are under direct influence of parties in the air transport system.

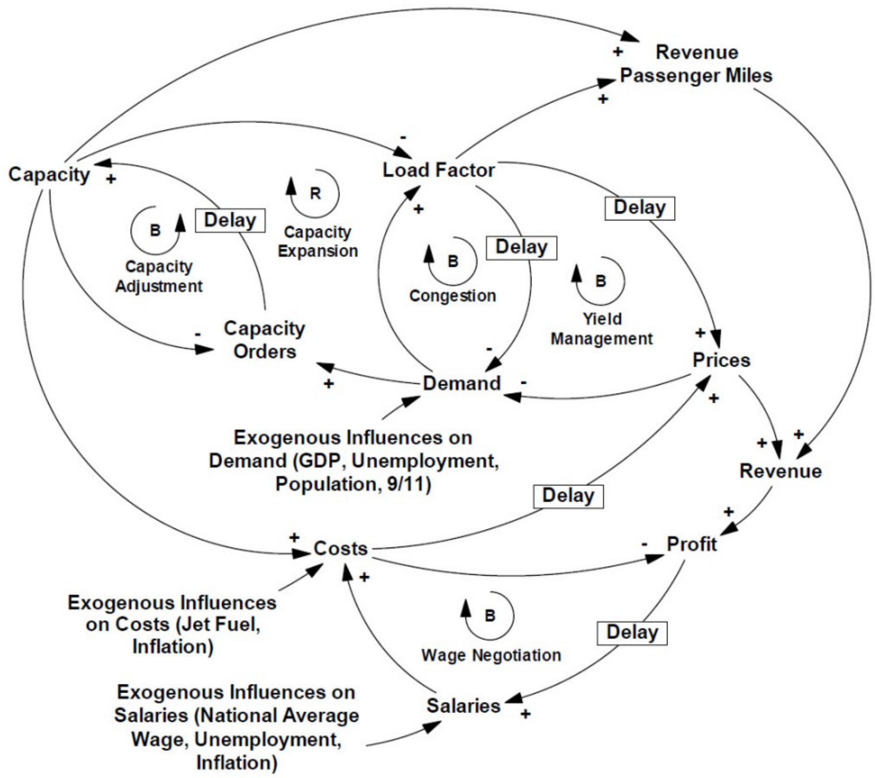


Figure 2 System dynamic model of air transport (Pierson & Sterman, 2013)

## Categorisation of changing influences

Together the endogenous and exogenous influences, as elaborated in the previous section, result in the change of the system, reflected in the revenue passenger kilometres (or miles). This section will explore the different types of influences that effect the system, with the sub question "*How can the influences on the air transport system be categorised?*".

Cyclic behaviour in ecological systems has according to Holling (1973) four phases: growth, conservation, collapse and reorganisation. Most interesting is the phase from a change perspective is reorganisation. During this phase the system adapts to sustain in the changed environment. Holling (1973) explains how the system can respond in this phase. The system can either absorb the change, or 'collapse to a new state. Key factor in the distinction between the two behaviours is his concept resilience: the tipping point of the effects of changes, between temporary effects (adsorbed by the system) or permanent (collapse to a new state). This tipping point is hard to determine, but can be approximated to assess the effect of change.

Although Holling studied ecological systems, it seems it can also be applied to air transport. Franke and John (2011) elaborate on recessions as moments for change in air transport. Hereby they make a distinction between short-term and long-term effects. Short-term behaviour is assumed always to return to a pre-recession level, while long-term significant changes to the system will take place. This paper redefines this classification, to temporary and permanent changes; when a long-term changing effect is present, the system change is permanent, but when the system recovers, without regard for the length of this recovery, change is temporary. Combined with the different natures of influencing events, the framework of Table 1 can be drafted.

Endogenous influences with a temporary effect can be seen as part of normal behaviour of a system. It might affect the balance of the system, due to an under- or overcapacity, but as long as the resilience threshold is not exceeded, recovery of the balance will take place without structural changes. A different situation arises when the resilience threshold is exceeded. The system will evolve to a new, permanent structure, to accommodate the effects of influence. Exogenous influences have a similar result. When the resilience threshold is not exceeded, effects will be temporary. It will create noise or disturbance to the system, without structural changes. This is in contrary with the influences with permanent impact, which will incur a changed system structure.

**Table 1 Categories of changing influences**

| | | Effect of influence | |
|---|---|---|---|
| | | Temporary | Permanent |
| Origin of influence | Endogenous | Normal system behaviour | Evolution |
| | Exogenous | Noise in system behaviour | New system structure |

## Flexibility of air transport

In the previous section a framework of different types of influences is drafted. To better connect the framework with reality, this section will focus on theoretical concepts that can help to explain the behaviour of the system, with the sub question "*How are the different types of change present in the air transport system?*",

Air transport is a complex system with many aspects. Buijs (2015) defines three core subsystems, which could be used to explain the structure of air transport: technology, market size and regulation. These sub systems contain many elements, but roughly a division can be made between supply (aircrafts and other technology), demand (market size) and regulator (regulation). Together these sub systems for air transport, what is graphically displayed in Figure 3.

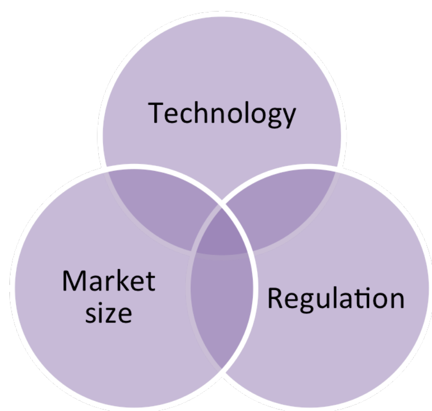


**Figure 3 Sub systems of air transport**

Many theories can be applied to explain the behaviour of these sub systems. As Buijs (2015) remarks, there is no single theory integrating all aspects of air transports, which can be used to describe all change of the system. Therefore four theories will be used, which combined cover all elements of Figure 3: evolutionary economics, hegemonic stability theory, transport geography and world-systems theory. Together they help to assess the systemic changes of air transport.

*Evolutionary economics* is according to Nelson and Winter (1982) the application of evolution theory to economic change. In this paper evolutionary economics will be used to explain the behaviour of both the technology as market size sub system. The main aspect of this theory according to Metcalfe (1994) is incremental development; it assumes a dependency between sequential events. Regarding technology, innovation is sequentially dependent, while inventions are random events from outside the system. This theory helps to explain the importance of changes, regarding a path dependency and the risk of a negative spiral due to feedback loops.

*Hegemonic stability theory* focuses on the distribution of power in the world (Snidal, 1985). It assumes a dominant country in an industry. Originally this theory was only applicable to trade, as Kindleberger (1986) proofs, but nowadays due to globalisation it can be applied to any industry. So it can also be applied to air transport. Two regions are leading in air transport, the United States and Western Europe. Both have large aircraft manufacturers and regulators, and take the lead for new agreements with other countries. The United States is, as inventors of air transport, still in the lead of air transport, which is also reflected in their dominance in deregulation and open skies agreements. Even though this dominant position looks very robust, in history the hegemon country changed approximately every century. This theory helps to explain the importance of a single nation or small group of nations be leading in an industry.

*Transport geography* describes how transport is distributed over the world. It explains how networks evolve, and why certain areas have more than proportionally would be expected (Glückler, 2007). Transport concentrates in hubs in leading regions, with a winner-takes-it-all principle. When market sizes change due to GDP developments, for instance a larger market to the Far East due to globalisation, new intermediacy hubs can exist, boosting air transport in new regions. This theory helps to explain the geographical position of hubs – an important advantage of the Gulf carriers, as Hooper et al. (2011) emphasize.

*World-systems theory* shows why poorer countries lack behind in economic development in comparison to rich countries, as Chirot and Hall (1982) define. It divides the world in three categories: core, semi-periphery and periphery. Terlouw (1992) defines a framework to categorise the countries, which is partly based on its GDP. Core countries are most flourishing, supported with cheap production (labour) in the semi-periphery and periphery (Chase-Dunn & Grimes, 1995). On the other hand the semi-periphery acts as a buffer between the core and periphery. This theory helps to explain the monopolist positions of richer countries in air transport, instead of a balanced network regarding market size.

With the above-described theories on (cyclic) change, it is possible to expand Table 1. below Table 2 is drafted, with the key concepts distilled from the theories above, broken down per sub system. Most relevant for assessing the systemic changes are the influences with permanent effects, which are made explicit in the table.

Table 2 Change types split per segment

| | Air transport system | | |
|---|---|---|---|
| | Technology | Market Size | Regulation |
| Temporary – endogenous | System behaviour | | |
| Temporary – exogenous | Disturbances | | |
| Permanent – endogenous | Innovation | Change of intermediacy & semi-periphery | New agreement types |
| Permanent - exogenous | Inventions | GDP-development | Hegemon change |

## Conclusion

As a socio-economic system air transport has many sub systems with complex relations. All sub systems are continuously prone to changes. Internal delays cause the system to have cyclic behaviour, implying a four phases approach. From a change perspective, most important phase in this approach is the reorganisation or recovery phase: the phase after a system downturn, in which it has to adapt to the new or changed environment, to become sustainable again.

From this point it is interesting to review the main question "*How can systemic changes in air transport assessed?".* As Table 2 illustrates, systemic change can have effect on multiple areas. Using this classification scheme can help to assess the possible effects of an influence. Therefore an influence has to be compared with the key concepts as described, to assess whether the resilience threshold is exceeded.

Technological the threshold can be exceeded when a party is innovative (endogenous) or inventive (exogenous). When there are no significant innovations or inventions it is unlikely the threshold will be exceeded, and there are no permanent changes. In the market sub system permanent change is likely when there are changes in point of intermediacy, change in semi-periphery or significant GDP-development. For regulation the two major drivers for change are new types of agreements or hegemon changes.

Applying this framework to the Gulf carriers, and endogenous influence, it shows they mostly profit of the changing demands in the world for air traffic. As intermediacy between the Far East and old economies they have been able to set up hubs. As extra impetus they have innovated the travel experience, with an emphasis on on-board comfort, with modern equipment.

But there is no change of intermediacy: global developments have created a new point of intermediacy. Traffic of existing hubs leaks to the new hubs, nevertheless they are not replaceable. They use the gap in current airline services, which exist due to underservice of legacy carriers to for example economic thriving Southern Asia, while worldwide traffic growth compensates the loss of legacy carriers.

The gulf carriers make use of the latest technology, to improve the travel experience, but all technology is originating from the USA or Europe, while it is available to all airlines worldwide. Developing air transport technology is very costly and time-consuming, which combined with the fact the Gulf carriers are not know to have endeavours in this area, leads to the conclusion the Gulf carriers will have no advantage over legacy carriers on this sub system in the coming years.

In the field of regulation the Gulf carriers are following the hegemon (the USA, and into a lesser extent Western Europe). So far they have not changed anything regarding regulation. New opportunities can occur when strict regulation is lifted. For instance route bans or capacity restrictions can restrain a latent market. But the very reticent industry air transport, significant changes on this field are highly unlikely, and so is a change of hegemon.

All in all the changes influenced by the rise of the Gulf carriers are not of a size that should raise expectations of a permanent system change. The geographical spread of air traffic makes it unlikely a complete change of core countries and semi-periphery will happen. Nevertheless the Gulf carriers can play a role in the system, they can take a part of the worldwide system, with a focus on a relatively new region. They will likely have a permanent place in the system, but will not be able to turn the system upside down.

## Recommendations

This framework assesses the systemic impact of the Gulf carriers. By categorizing possible effects, it is possible to get a better understanding of the current situation, and possible future roles of this group of carriers. By early detecting possible risks, it might be easier to defer threats to less impacting categories.

Although the conclusion of this research is quite relieving for legacy carriers, it is wise to monitor the situation continuously. Future changes might affect the position of the Gulf carriers in the framework, and thereby the impact. Also the level of the threshold of resilience is not fixed, and can drift to a lower level, increasing the impact of the Gulf carriers.

This research can also be a motivation for further research. The framework in Table 2 is used to assess the impact of the Gulf carriers, but can help to classify trends like a new type of carriers. Although a generalised approach is used, it is focussed on the influence of the Gulf carriers to the system. This way it can be used as a kick-off for a more in-depth grounded theory research, on a multi-useable framework. The framework of this research can be used to other situations, but it is possible certain elements are not represented.

Another approach is to make use of data mining of big data, to get a more quantitative clue of the tipping point. A more quantitative clue of the resilience of the system can help to assess threats better and faster, helping to mitigate risks and turn threats into chances.

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