*GeoProgress Journal*, vol. 7, i. 2, 2020, Geoprogress Editions
ISSN 2384-9398
DOI

# STRATEGIES OF RESILIENCE TO PANDEMIC STORM IN THE AIRLINE INDUSTRY

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*Abstract*

This paper aims at arising new points of view based on the 2020 main learnings related to aviation sector.
Specifically, the research analyses market reactions to the Covid-19 crisis and possible organizational responses offered by airlines.
The novelty of this research work shows difficulties in obtaining current academic research material and previous finding, however results of this research demonstrates possible resilience strategies for airlines, as a reaction to the pandemic's disruptive effects on the transport sector.
This research offers an analysis of adopted solutions that could be useful in modifying the offer of airlines, for possible future similar situations, even if it is necessary to bear in mind that this field has no significant experience in contingency planning when it comes to world-wide pandemics. In this paper the new solution to improve resilience response to crisis is introduced. It is called "preighters", i.e. aircraft originally intended to carry passengers, are refunctioned and operated temporarily as a cargo aircraft with freight in the passenger cabin.

*Keywords:* Aviation, organizational resilience, Covid-19 pandemic, business models, preighter

## 1. Introduction

Air travel is a fundamental element in economic geography reasoning, in global production value chains as well as in tourism. During Covid-19 pandemic a new attention to transport flows due to that disruption has emerged in travel and goods movements, since their transport is, as is the production, linked not only to economic dynamics but also to social, cultural and political dimensions.
The aviation market has been challenged by the pandemic. Almost literally for the whole of 2020 and a good part of 2021 there has been no more flying with the risk that the highly competitive scenario, represented by aviation, will be largely altered, with several players unable to withstand the emergency.
A total of 1.8 billion passengers flew in 2020, indicating a 60.2% drop compared to 4.5 billion in 2019.
The figures reveal a sharp reduction in traffic, with an overall 65.9% fewer passengers carried per kilometres flown (RPK). These data show also that demand for

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international passengers fell by 75.6% compared to the previous year, while demand for domestic connections dropped by 48.8%.
Statistics show that the 2020 passenger drop was the largest recorded since global RPKs started to be considered around the 1950s.
On the supply side, we also saw several disruptions; a major contraction; air connectivity dropped by more than half in 2020, with routes flown falling by 40%, compared to the previous year.
Over and above, also the 2021 figures also show limited traffic, low revenues and large financial losses.
In order to understand how the crisis in the sector is evolving, it is necessary to consider as a reference the 2019 data, with a normal demand model, since comparing the monthly results for 2021 and 2020 would be distorted by the impact of Covid-19.
Passenger traffic in June 2021 fell by 60.1% compared to the same month in 2019, but this represents a small improvement on the figure of -62.9% recorded in May 2021 compared to May 2019 (IATA, 2021).
The situation of the drop in supply and demand is very serious compared to land-based transport, just because, even going back over the scenarios of past crises, the sector has always been very sensitive to economic crises.
In particular, the segment most affected by the pandemic is the long-distance transport, which not only has seen a drastic reduction in passengers but also in goods that were transported as cargo on many scheduled passenger flights, thanks to the numerous schedules and destinations, which therefore did not require all-cargo flights.
Aviation, therefore, face a double challenge: survival of the airlines within the market and change of the same, from here onwards, imagining survival strategies for the current situation that can become organisational changes for future models.
Air travel industry is significantly suffering and there are inevitable disruptive consequences for the world economy, but not only.
The air transport industry is highly influenced by market trends. Specifically, an increase in demand requires an increase in transportation supply, on the other hand, a downward contraction has a negative impact on the sector, with a decrease in the number of passengers in the industry and a change in the traffic flows, with the need of new organizational strategies (Hotle & Mumbower, 2021).
As already seen during the 9/11 crisis, panic coming from terrorist attack - people are no longer motivated to travel, as they are living in a climate of fear and uncertainty.
The impact of Covid-19 pandemic is also recorded at a social level; for months, in fact, citizens have remained confined in their homes continuously bombarded with slogans sensitizing to the quarantine. As it is demonstrated, the damage caused by the Covid-19 on the economy depends, first of all, on when the alert will actually end and then on the governments and their decisions about how to allocate money for support and recovery.
A crisis much worse than the financial one experienced in 2008 as reported by IATA, "the highest in the history of aviation and it is far greater than that suffered during the financial crisis, which was 31 billion dollars in 2 years"(IATA, 2020).
This research aims at investigating how it is possible to try to contain the damage for the civil aviation sector, outlining strategies and organisational models for further use also in future, in case of a similar challenging scenario. Moreover, this work intends to underline how organizational resilience can offer response strategies.

As we see, the challenge required to commercial aviation has meant that some companies have had to find instruments to ensure their survival, while waiting for a resumption of commercial passenger transport services.
This analysis, thus, shows how converting to the use of aircraft in the short term was the answer, in terms of organizational resilience, to the low number of passengers and to meet the needs for freight.
After analysing air transport demand, supply and trends following the pandemic, the research highlights why existing freighter aircraft were insufficient to meet demand and the price for air cargo increased and, for which reason, it was necessary, as we will discuss, to offer new solutions in the industry, that even after the sharp drop in passenger numbers had to find innovative solutions overcome the crisis.

## 2. State-of-the-art

The majority of existing research on the aviation industry's response during a pandemic has focused on the accessibility of the airline network and on the spread of airborne diseases (Bowen & Laroe, 2006; Ferrell & Agarwal, 2018).
Due to the new nature of the Covid-19 crisis, studies have primarily focused on the impact of the virus on the aviation system, on the links between medium- and long-term effects (Suau-Sanchez et al, 2020) and on labour issues (Sobieralski, 2020).
However, few analyses have been conducted on how the contingency of the crisis was handled.
Most of the epidemics and economic crises occurred in the past are not models that can be used to deal with the Covid-19 pandemic scenario.
Air transport, in fact, reacted to other health emergencies that, when analysed in-depth, differ from the one under review.
For example, Sars epidemic crisis (2001-2004), due to the greater difficulty of transmission, remained localized in the Asia-Pacific area, having an important impact on the demand for air transport only in China, Hong Kong, Singapore and Taiwan; the consequence on aviation in the year of greatest diffusion, i.e. 2003, was therefore a sharp drop in traffic, with 35% less RPK, i.e. the number of passengers transported per km flown, but involving only the companies mainly exposed to the eastern market. After Sars, the return to normal traffic flows took almost nine months (Kuo et al., 2008).
Also interesting to analyse are the results of studies on avian flu which, however, did not have a major negative impact on transport demand in Asia, despite the high mortality rate (Kuo et al., 2008).
This explains the gap in research and justifies the need to evaluate strategies that have been implemented without using previously known scenarios.
Additionally, we can also highlight the outcomes of Mers epidemic crisis, a similar Sars flu, which had quite a strong impact on aviation (about 12% losses), with economic damages for airlines and a consequent drop in revenues, but whit a spread only in a particularly circumscribed geographical area, i.e. the Middle East, affecting only the operators present in that market and requiring about six months to determine a recovery of demand up to previous levels.
To tackle this gap in research, the study examines organizational resilience in the pre-crisis and crisis response phases and how effective they were.

## 3. Discussion

*3.1 The contingency to deal with*

As introduced, the year 2020 was characterized by the pandemic scenario generated by the worldwide spread of the Sars-Cov-2, also known as Covid-19 pandemic.
Similarly, to what happened in 2003 in Asian countries with already mentioned Sars, Covid-19 is an airborne virus, whose effects can always be traced back to acute respiratory deficiencies, able to paralysed the entire transport sector, especially passengers in the air transport system.
In this case, in fact, the pandemic spread more rapidly than Sars. From the first infections in China in late 2019, the virus has circulated in Europe (initially in Italy) in a very short time and subsequently has become widespread in North and South America, without, unfortunately, any possibility of containing it and its consequences effectively (Liu et al., 2020).
Although services for the mobility of people and goods were included among the economic and production sectors not subject to suspension of activities, measures taken by the national and international authorities have reduced the possibility to fly for several months, limiting mobility exclusively to reasons of work, health, or absolute necessity and have enacted restrictions on entry and exit in various countries and the closure of different airports.
Similar to the effects of 9/11 had on air travel, the Covid-19 pandemic has created an unprecedented worldwide crisis, leading to significant and structural changes in aviation (De Andreis, 2020).
In fact, the sector was forced to react to a new crisis without, as stated, clear scenarios and/or similar previous crisis models that would allow to determine a temporal development and to identify possible strategies.
Therefore, the result was that organizations had to deploy all their resilience strategies to survive and to react to events, moving essentially in uncertainty.

*3.2. The meaning of resilience from an organizational perspective*

Starting with a general definition on resilience, this is a concept transposed from the engineering fields, expressing the propriety of a material to absorb elastic deformation energy. The metaphor in the economic system means the capacity of a system to react to a shock and return to initial conditions or in other similar ones after adaptation (Grandi, 2018). In other words, we can state that the concept invokes the ability of an entity to bend but not break, i.e. to "bounce back" from adversity, surviving, ore sometimes growing up and reinventing itself.
Thus, resilience nearly assumes the meaning of a "competence" of the organizations, possibly present in every individual or system, which allows not to succumb to adverse events but to react and reach, or return, to a state of a previous equilibrium.
Based on this definition we can say, therefore, that resilience could be seen as a dynamic and volitional competence necessary to act in the current contexts - such as aviation - characterized by high instability and sudden changes, just the way the pandemic has shown us and is still showing us.
Moving closer and closer to the idea of organizational resilience, it can be said that it holds the value for an organization to anticipate, to be prepared, to respond and to

adapt to incremental change and sudden disruption, with the goal of surviving and succeeding, or rather reinventing itself.
Resilience is not limited to pure risk management but aims to achieve a holistic view of organizations' health and success. A resilient organization, in fact, could be seen as the one that not only lives long, but thrives, overcoming the challenges of time.
From this consideration it follows that when we talk about resilience in organizations it is not just about managing risks but, more importantly, it points to an integral view.
A business aiming to succeed in today's increasingly dynamic and interconnected world, clearly needs excellent organizational resilience that is sought not only in individual performance but above all, in the long term, as the result of the interaction between the system and its environment, in a dynamic and evolving process (Vogus & Sutcliffe, 2007).
Over time organizations, relying on their own resources, should acquire knowledge, skills and abilities useful to face with a positive, creative, and optimistic attitude.
Successful organization not only should set their goals but also be able to make timely decisions to achieve these goals in ever-changing environments.
In the Covid crisis, uncertainty, lack of information, incomplete statistics and absence of similar reference models have placed airlines in a challenging situation, forcing them to act- despite not having a clear path to follow - in ambiguous, incomplete, and constantly changing environment.
Analysing what has happened, we can affirm that this challenge has been taken up by various players in the commercial aviation that, aiming at survival, have adapted strategies that have proved or are proving valid in the short and medium term.
As is well known, the pandemic had a considerable impact, both operational and economic, on airlines, as well as on airports and air navigation service providers.
Changes in passenger behaviour during the pandemic period, travel restrictions and the subsequent economic crisis have led to a drastic drop in demand for air services.
Along with an almost complete evaporation of global passenger traffic, global cargo volumes have also declined sharply. A decline caused by capacity constraints, which, as discussed below, began to be alleviated when passenger aircraft were put back into service carrying cargo.

## 4. Results

### *4.1 Introduction to the importance of Air Freight*

The picture of the airline industry for a long time, i.e. during the first part of the pandemic, was bleak. Around the world, airlines have grounded their fleets due to the fact that passengers are unable or unwilling to fly.

Middle East: 8 million passengers, a decrease of 67.6%
Europe: 389.9 million passengers, a decrease of 67.4%
Africa: 34.3 million passengers, decrease of 65.7%
North America: 401.7 million passengers, a decrease of 60.8%
Latin America: 123.6 million passengers, a decrease of 60.6%
Asia-Pacific: 780.7 million passengers, a decrease of 53.4%

*Table 1: regional rankings based on the total number of passengers carried on scheduled services by airlines registered in that region in 2020 compared to 2019 Source: IATA*

The plummet in the number of flights had a strong initial impact also on air cargo, due to supply chain disruptions caused by strict lockdowns, the lack of belly cargo capacity due to the grounded passenger fleet as well as the direct impact of lockdowns on demand. Thus, it caused a mismatch between the supply and the demand for freight; while demand for cargo remained higher, the ability to carry goods, as was normally the case in the holds of civilian aircraft, which had been reduced in frequency, was also limited. Many scheduled flights, normally, carried large quantities of cargo in the holds to meet export demand, but flight cancellations and frequencies reduction were such that new modes of transport had to be devised. This is when innovation is introduced, i.e. when passenger transport gives way to freight and, therefore, most of the freight began to be carried by empty passenger aircraft, as an adaptation to a new market reality. This adaptation has been fast, but more measures to curb the consequences must be taken.
The introduction of novel solution can be implemented in the next future in case of a similar event, involving the starvation in passengers' flow. Following, we will show how the implementation of fast convertible to freight planes is a critical feature the future fleets, making it a fleet of preighters.
A passenger aircraft that can become an almost fully loaded freighter is very versatile in order to restore the missing cargo capacity.
The novelty of this publication makes demonstrates how the supply side of air traffic can change in response to a crisis that still swings between moments of restarting flows and moments of severe slowdown, due to the many infectious variants.

*4.2 How the world was before and how Covid affected the schedule*
In this fast-moving economy, especially when considering aviation, predictions are crucial, and airlines heavily relies on passengers and cargo demand, so that it is possible to allocate resource to different branches of the network, in the attempt of meeting the demand.
Meeting the demand with the right amount of supplies it is crucial to for airlines and that ones can do so are those gaining the largest share in the market. Planning is a strategic necessity to acquire advantages over the competitors and gaining larger market shares.
The kind of aircraft and routes to serve are custom-made on the consumers' demands, and often the demand can be influenced by supply.
Accelerating the optimisation of resources on a long-term perspective, and yet remaining competitive, can be difficult to achieve. Seasonally there are fluctuations in passengers' flows, for this reason combined flights are generally used to serve promiscuous routes where it is needed to allocate up to 300 passengers on board and their luggage and still satisfy the cargo demand. At the moment major aircraft manufacturer offer for the long range are the Boeing 787 or the Airbus A350. These planes perform their best on a full load in order to maximise the profits.
In the current situation it was possible to give more importance to freighter and combi planes. It is important to underline that combi aircraft in commercial aviation are

different from the first ones because they are a permanent option since they are aircraft that can be used to carry either passengers and cargo because they may have a partition in the aircraft cabin to allow both uses at the same time in a mixed passenger/freight combination.


*Figure 1: A KLM Asia B747 converted to carry freight*
*Source: KLM website*

Covid-19 has disrupted these routing habits; entire fleets have been grounded and belly cargo capacity has decreased by more than 50%. In addition, the crisis that pandemic has caused and is causing to airlines has meant that the airlines, still in serious difficulty, are looking for possible solutions to guide their future offerings, bearing in mind that cargo service must be guaranteed since it is the world's lifeline.
The approach that has been learnt by aviation players is to have a contingency plan that not only offers answers to the current situation, oscillating between upswings and standstills, but also provides new ways of thinking about the business models.

*4.3 Contingency planning*
Contingency planning designs solutions for predictable events but very unlike to happen; this because it is impossible to plan everything for any single possible event to occur.

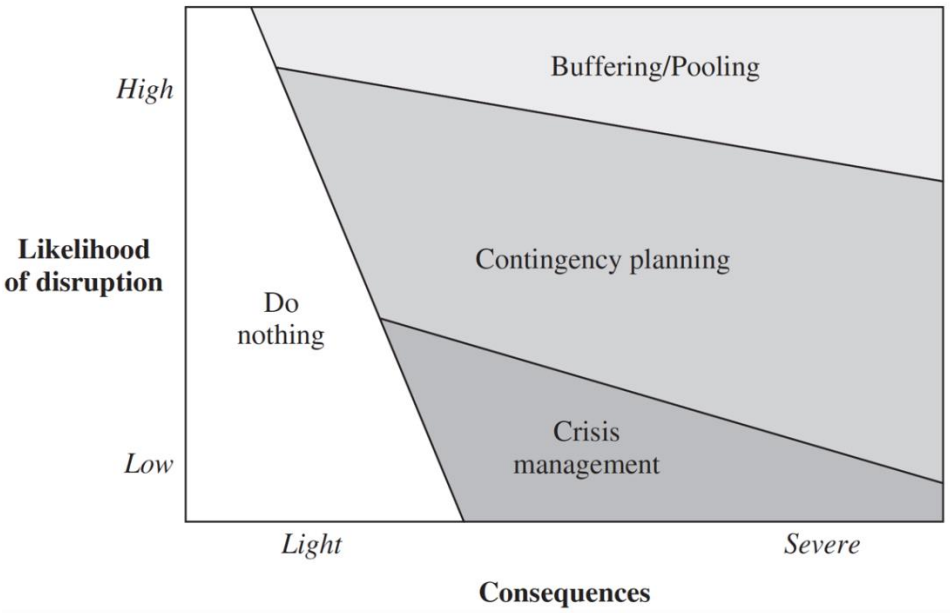


*Figure 2: Contingency diagram*
*Source: Author's elaboration*

This paper suggests different approaches for risk management and a contingency plan based on the 2020 and 2021 aviation industry experience, which we can see is based on four pillars., i.e. new strategic assets, innovation, innovative solutions without including a change in the core business and, finally, leasing or chartering flights.

*1 The need of a new strategic asset*
The "preighter" represent a recovery and resilience response to crisis A preighter is a new "implementation" recently introduced by airlines, unlike combi planes, which, being configured in this way, must be designed for routes where passenger and cargo demand remains constant.
A preighter, also known as cargo in cabin, is an aircraft originally intended to carry passengers but which is operated temporarily as a cargo aircraft by loading freight in the passenger cabin. The term is a *portmanteau* of "passenger" and "freighter" and is attributed to Lufthansa chief executive Carsten Spohr, who has been the first to give the phenomenon a name in May 2020.
It is based on the use of passenger planes to meet cargo demand, in this way airlines can benefit and provide useful services, such as:

- use of their planes that otherwise would be grounded and it translates in constant (preventive) maintenance;
- cost reduction: their use of the plane can be a way to use resources that have already been invested such as cabin crew, airport landing slots, transportation agreements;
- a strategic support to the community and humanity; due to the importance in particular of transporting certain goods considered essential at some times, thus to ensure – for instance – food safety;
- being robust now might be translated in the future as a renewed market with less competition.

*GeoProgress Journal*, vol. 7, i. 2, 2020, Geoprogress Editions
ISSN 2384-9398
DOI

*2 Leading the innovation*

Various airlines, particularly on the routes of North Pacific, between Europe and Asia and of North Atlantic (IATA, 2021), have converted their planes in preighters, in the perspective of possible long disruptions and some of them are more radically changed that others. The majority of airlines intends to adapt to the market, with the actual conversion of many wide-body aircraft, precisely because of the greater sensitivity of long-distance traffic in times of crises.

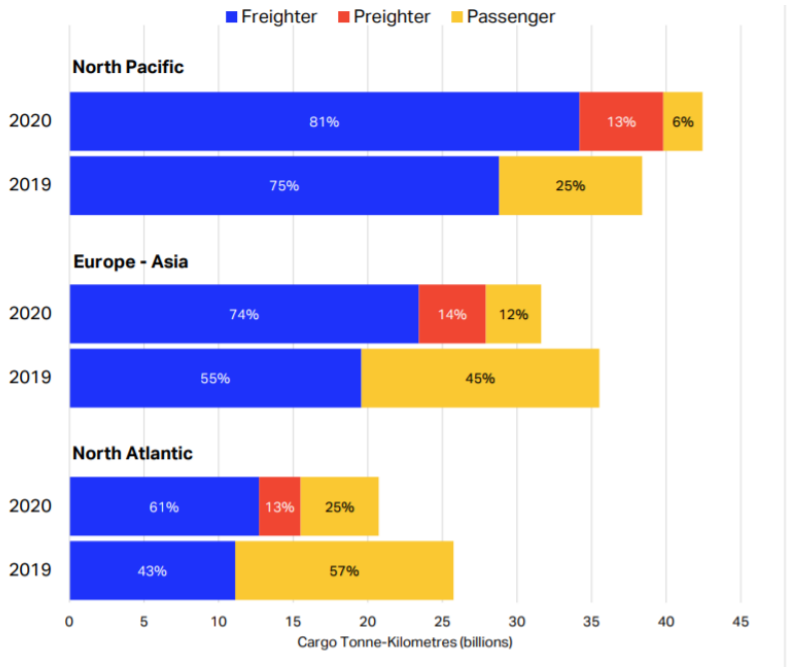


*Table 2: Scheduled cargo tonne-kilometres by type of operation.*
*Data refer to the period of April to December of the respective year*
*Source: IATA Economics*

The general idea is that, when a high fluctuation in the passengers' flow will hit again and an air freight mismatch occurs, airlines, therefore, could easily convert their planes and satisfy the cargo demand. It is a temporary solution that can be achieved by the use of preighters. Carrying cargo in these planes, especially in the peak of pandemic, it has been the difference between survival and bankruptcy for many airlines.

*3 Implementation of innovative solutions and not changing of the core business*

The analysis shows the ability in which several airlines (Lufthansa, KLM, Singapore Airlines, Asiana, former Alitalia, British Airways, Korean etc.) adopted this variant and the consequences of its use. However, various aspects of the aviation industry must be mentioned, since the need for change is something strategically fundamental in aviation.

The solutions for a restart appeared to be very important, even if obviously nothing will be as it was before the pandemic, since commercial airlines need to change their

organisational models in order to respond to the uncertainty of future scenarios, that could occur in the future similar to the present one.
Innovative strategies, such as the one mentioned above, could offer a possible solution to the continuous acceleration in the change of air travel patterns.
Therefore, we can state that airlines, like any other economic activity, cannot change their core business. However, interesting solutions can be adopted, such as the one illustrated which could be a success if properly considered.
Prior to the precipitous drop in air travel cargo capacity in the belly hold of passenger aircraft accounted for half of global air freight, rising as high as 80% on transatlantic route and through the use of pregheiter a good solution has been found which can also be considered in the future (see Table 2).

*4 Charterisation of flights*
Although, airlines have added a wider range of arrows in their quiver, airlines have completely closed (temporarily) their liner passenger branch, aiming a charter operation (relying on the demand aggregation, and also forced by governments to operate repatriation flights) and goods transportation (Lee, 2021).
In many cases airlines only operated cargo flights, also relying on their cargo division, nonetheless, all these solutions can be seen as alternatives before returning to fully operate routes. If many cargo airlines were needed, we would have seen them some considerable time ago.
Also, because opening a cargo division does not require the mere purchase of freighters.
Thus, these for pillars might be considered by airline for increased resilience and decreased vulnerability to the next sudden crisis assuming that different and innovative strategies to increase airline flexibility are likely to produce different and positive effects on airline's performance.

## 5. Conclusions and recommendations for future research

To the best of the authors, this paper is pioneering and it is one of the first time the Covid-19 is attempted to be put in relationship with innovative solutions such as preighters and charterisation of airlines as part of a future contingency planning.
The paper contributes to existing literature and enlarge the knowledge on a topic which is not widely studied due to the novelty.
After analysing the supply and demand mismatch, the naturally born preighters as a solution is proposed, however this innovative solution involves several constraints. In a preighter configuration, the passenger door is definitely a bottleneck which decelerates the loading and offloading operations (plus, it is resource consuming), future research could analyse:
- Analysed from an engineering perspective, a cargo door at the passengers' main level,
- Innovative loading machinery.

To conclude, the optimistic forecast of Boeing concerning large freighters (747 and 777) being more than 70% of new factory-built aeroplanes was realised only partially. Airlines are recently moving to air freight (IATA, 2021).
What happened to some airlines, i.e. reconfiguring aircraft by removing the passenger seats to create more space for cargo and allowing each aircraft to carry up to 12% more

freight than a usual commercial aircraft, shown as that organizational resilience could offer a solution of business continuity, in an industry so exposed to market changes, such as aviation. This also helps us optimise the usage of cargo belly-hold space, as higher-density shipments can be carried after lighter and more volumetric cargo are loaded in the cabin.
In this research paper, ground for future research has been prepared, creating the favourable conditions for the researcher.
This is the peak of cargo logistics, how to manage the logistics in difficult times. The effort to be put in place is a lot and consequently everything must be managed properly. It remains valid that any disruption is not a normality and, hence, it will fade away, it is only a matter of time, so it is better be prepared for the upcoming disruption without affecting the actual feasibility of the activities.
Organizational resilience has shown us how acceptable solutions can be considered by air transport in response to pandemic events.
To conclude, in fact, innovative solutions even if can be valid only when the disruptive times will come, however they offer a competitive advantage to those who implement them, a plus that gives the possibility to resist and to look at the future, without bankruptcy as happened to several players in the market.
Nevertheless, these solutions must respect the following requirements: Low-cost; Easily implemented; Can be a latent implementation, in order to be considered as efficient in term of flexibility.

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