



Remediating sub-Saharan Airline challenges and limitations



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Background: Air transport connectivity to and within Africa is provided by both African and non-African airlines. These carriers are confronted by both intrinsic and extrinsic challenges, which constrain their ability to provide the level of air transport connectivity demanded to fully enable economic growth for the continent. In addition, since April 2020, the reduction in air connectivity resulting from the coronavirus disease 2019 (COVID-19) pandemic has further constrained the capacity of the air transport industry to meet the passenger and freight demand.

Objective: The primary objective of this study was to identify the challenges faced by the airline industry in sub-Saharan Africa in meeting the air transport demands of expected economic growth, and to rank the identified challenges in terms of their urgency and importance.

Method: Initial data were collected from three sources: (1) a review of the literature, (2) industry reports, and (3) as a further but secondary resource, the key inputs into air connectivity model metrics were used to identify additional possible key result areas.

From these data, the study derived open-ended questions as prompts for face-to-face (not virtual) interviews with chief executives of the airline industry. This enabled triangulation of the initial data for verification, and then prioritisation for its application in a possible subsequent project-based remediation strategy.

Results: This study revealed that lack of route liberalisation, management weaknesses, state protection, lack of competition, connectivity challenges and the need for airline partnerships were the most important challenges faced by the industry. In this study, the identified challenges were ranked by thematic analysis.

Conclusion: The key products of this study include the identification and ranking of the challenges impacting the sub-Saharan African air transport industry.

Keywords: African airlines; air transport challenges remediation; aviation; air connectivity.

Introduction

Social value

The social value of this study may be understood in terms of sub-Saharan Africa being home to around 1.12 billion people (WPR 2021), the majority of whom are being systematically underdeveloped by the failure of their economies to grow at a rate that keeps up with the population growth rate (InterVISTAS 2014). Airline transport linkages provided by both the African- and non-African-based airlines are key to developing the trade which underpins economic enterprise (International Air Transport Association [IATA] 2016b) (African Development Bank Group [ADB] 2017) as, because of the inadequacy of road and rail linkages, airline connectivity is expected to bridge the transport gap. Thus, the limitations of the airline industry to meet this need may be considered relevant to the well-being of almost 1 billion people.

Scientific value

The scientific value of this study was to systematically identify the challenges faced by the sub-Saharan airline industry by conducting a survey of the literature, industry reports and the key inputs into air connectivity model metrics in order to identify additional possible key air connectivity metrics relating to the industry. The literature review provided an overview of the key challenges facing Sub-Saharan airlines and laid the groundwork for a concise review of key industry reports. These reports were primarily derived from reports on the proceedings of the following African aviation conferences:

- African Airline Association (AFRAA): 2015, 2017 and 2019.
- Airlines Association of Southern Africa (AASA): AGA, 2019.
- BARSAA: AGM, 2019.

They provided information specifically addressing the challenges faced by the African air transport industry.

A selection of air connectivity metrics was surveyed, and the key components of these metrics were identified for inclusion in the list of possible challenges facing the sub-Saharan airlines. The key metrics surveyed were as follows:

- (1) Air Connectivity Index (ACI).
 - (2) Logistics Performance Index (LPI).
 - (3) Air Liberalisation Index.
 - (4) Air Trade Facilitation Index.
 - (5) E-freight Friendliness index.
1. The ACI is a broad based 'catch-all' measure, which is particularly useful for African studies as it can be used to calculate air connectivity for places that do not yet have direct flights. It is also noted that the ACI broadly covers two of the seven most important challenges facing the African air transport industry, namely the challenges the airlines face from connectivity limitations and the need for better connections and route network expansion through partnerships, code sharing and alliances. A further key feature of the ACI is that it focuses equally on passenger as well as freight movements.
 2. The LPI relates to the movement of goods and thus trade. In this regard, as a key concept, it has the need for improved transport of goods so that producers may better compete and thus either enter, or more fully participate in, global value chains (GVCs).
 3. The Air Liberalisation Index addresses the challenge of the lack of air route and market liberalisation through restrictive bilaterals and government protection of their national airlines.
 4. The Air Trade Facilitation Index has a large component of subjectivity in that it surveys managers active in this industry, and in this regard may be found to be reactive in that the index could be expected to automatically increase as the first three indices increase.
 5. The E-Freight Friendliness index is, like the Air Liberalisation Index, fundamentally subjective in its survey of senior management, and in this regard, lines up with this study's focus on interviews with airline chief executives.

The study then triangulated those findings against the face-to-face (in-person) interviews with chief executives of the African airline industry.

The key component of the conceptual framework is the concept of air connectivity as articulated by Pearce (2007) and developed by Arvis and Shepherd (2011) and Shepherd, Shingal and Raj (2016) for the World Bank, and its application by IATA (2016a) and ATAG (2017). This broad concept of connectivity has subsequently been refined by numerous

transport economists into a variety of indices that measure specific aspects of connectivity.

Literature review: Air connectivity and economic growth

The International Civil Aviation Organisation (ICAO 2019) defines air connectivity as 'a measure of a network's concentration and its ability to move passengers from their origin to their destination seamlessly'. In practical airline terms, 'concentration' refers to the frequency of flights and the number of seats available, and 'seamlessly' refers to the ideal for having none, or as few as possible, intermediate stops between the Origin and Destination pair. Thus, connectivity may be reduced to three simple aspects: frequency of flights, number of seats and number of stops between an origin-destination (O-D) pair (York Aviation 2004).

The consequences of impaired air connectivity are that many places in Africa are underserved by airlines in that there are few flights, and seats are prohibitively expensive, particularly when compared with competing tourist destinations. Limited routes, with few flights and expensive seat prices, are mutually reinforcing and aggravate the problem of lack of direct air linkages between many places in Africa.

Selected existing connectivity models were surveyed to assess their applicability to the proposed conceptual model. Of note were key components identified in the following models: the ACI, for air linkage connections, seat availability and flight frequency (Arvis & Shepherd 2011); the Air Liberalisation Index for the extent of deregulation and liberalisation of passenger air service (World Trade Organisation [WTO] 2006); and the Air Trade Facilitation Index (Arvis et al. 2016) for ground-based handling and customs formalities. These connectivity models informed the key challenges identified in the study findings.

African airlines

IATA defines the African airline industry as the 161 active airlines based on the African continent and associated islands (Matters 2018). Bofinger (2009, 2016), Considine (2013), Bekele (2016 & 2019), and IATA (2016b) argue that African airlines have failed to cope with the needs of transportation and air connectivity within the continent. Limited air connectivity hinders tourism, restricting the contribution of the tourism sector which is essential for economic growth of Africa (Arvis et al. 2016; Njoroge & Samunderu 2020; Sylva & Amah 2021).

Morphet and Bottini (2013) argue that tourism reduces trade barriers, and thus, conversely, the hinderance of tourism may be expected to increase trade barriers, the reduction of which has become increasingly key to economic growth. It may be readily observed that the causality between economic growth and improvements in air connectivity is bi-directional in nature.

Airlines and economic growth

The Gross Domestic Product (GDP) growth of Africa was expected to be between 5% and 6% per year before coronavirus disease 2019 (COVID-19) (World Bank 2021). It is expected to rebound to a 'new normal' post-COVID-19, following an increased demand for commodities (ADBG 2021). It follows that any constraints on trade imposed by limitations in air connectivity because of the challenges faced by sub-Saharan airlines, as well as the foreign-based carriers serving Africa, will adversely impact the post-COVID recovery.

Morphet and Bottini (2013) proposed that the airline industry fulfils two key functions in enabling economic growth: Firstly, the movement of people and thus their knowledge and skills, as well as providing essential air lift capacity for tourism; secondly, the transport of production inputs, and in particular, high value, low mass and volume outputs.

Pottas (2013) pointed out that the development of emerging markets requires a corresponding increase in airport capacity and airline connectivity. If such an increase does not happen, Pottas (2013) suggested that economic growth will suffer, and that a place or producer will become increasingly marginalised by being overlooked for GVC participation.

Trade and tourism

The ADBG (2017) maintains that a key challenge to African growth is to develop intra-African trade, that is, trade between African states and between the economic trading blocks. Of specific note in this regard is the African Continental Free Trade Area, in which 28 countries participate. The basis of these trade agreements is to develop intra-African trade, and to accomplish this, there must be effective intra-African transport links. In this they are part of a broader strategy to develop intra-African trade, which includes the launch of the Single African Air Transport Market and the AU Passport (Onwuka & Udegbonam 2019).

Ishutkina and Hasnman (2009) contended that the continent should not become dependent on the low value-addition of exporting primary production, but should rather focus on the development of intra-African trade. This need arises from the colonial legacy, where writers such as Pakenham (1991) and more recently, Olamosu and Wynne (2015), amongst many others, argue that the ground-based road and rail infrastructure are not fit for intra-African trade, as it was designed to transport raw materials from the hinterland to the ports for exporting to the colonising state. It is, therefore, argued by InterVISTAS (2014) and IATA (2016b) that in the absence of an efficient intra-Africa ground-based transport infrastructure, air transport has a vital role to play in African economic growth.

At a macro-economic level, the airline industry has enabled companies and, indeed, whole countries to participate in GVCs (OECD 2017). For Africa, participation in GVCs is essential to growth as they enable producers to exploit their

competitive advantage (Porter 1990) by adding value to specific links in the GVCs. Schlumberger (2010), Morphet and Bottini (2013), and IATA (2017) posited that as a consequence of the challenges faced by the industry, state ownership and protection of airlines and the associated lack of route liberalisation, amongst other factors, have impaired airline connectivity in Africa. The high price of seats, the infrequency of flights and the lack of direct flights are all aspects of this poor air connectivity. With few exceptions, African airlines are limited by lack of profitability, limited routes, low yields and poor connectivity (Abate 2013; IATA 2016b). In addition, flights in Africa are infrequent and expensive, and these two qualities have a direct effect on the level of connectivity provided by the airlines (Bofinger 2016; Heinz & O'Connell 2013; Oxford Economics 2011).

These, and other challenges identified during this research, account for the high failure rates for African airlines. Schlumberger (2010) and Morphet and Bottini (2013) proposed that as a result of this high failure rate, the challenges faced by the airlines have impaired airline connectivity in Africa. The consequences of limited air connectivity have been shown to impact trade, both in terms of cargo and in the supply of skills (passengers) (Saslavsky & Shepherd 2012). In a seminal study for the aviation industry, Arvis and Shepherd (2011) established the causality between improved air connectivity and increasing trade and economic activity.

Oxford Economics (2011), ATAG (2016) and ADBG (2017) show that the growth of both developed and emerging markets requires a matching increase in air transport connectivity. This then suggests that a programme could be undertaken to increase the capacity of the sub-Saharan air transport industry. Such a strategy would, as a point of departure, commence with an identification of the challenges faced by the industry, which have been identified by this study.

Challenges facing sub-Saharan airlines

As limited to discussion in this article, the aim of this study was the identification, ranking and prioritisation of the challenges facing the sub-Saharan air transport industry. While it is acknowledged that air connectivity in Africa is also provided by non-African-based carriers, these carriers are excluded from this study for the following reasons: intra-African connectivity is an important component to African economic growth and foreign airlines play a relatively small part in this intra-African trade: Bofinger (2009), ADBG (2017). A review of intra-African airline schedules shows that few airlines are providing intra-African air connectivity. This may be because of the reluctance of African governments to grant Fifth and higher freedom rights to non-African carriers (Considine 2013). Of note, ICAO reports that 'for 23 African States, 80% of the international air services are offered by African carriers, and for 50 African States, over 50% of the international air services are offered by African carriers.' (ICAO 2019:25).

Research methods and design

The setting for this study was the sub-Saharan airline industry, which included the island-based airlines of Mauritius, Reunion and Madagascar, as well as the associated agencies and representative industry bodies.

The scope of this study was the sub-Saharan airline industry. The researchers excluded aspects of the industry, which were not directly relevant to the scope of the study. Thus, for example, although the review of the literature examined aspects of the airline industry such as the travel agency industry and auxiliary revenue partners such as loyalty programmes, these were not considered central to the scope and focus of the study, and thus, were discarded on the basis of the insights gained from the CEO interviews.

Study Population and sampling strategy

As noted, the estimated number of active African airlines, pre-COVID-19, was 161 (Matters 2018), which, with the inclusion of key past C-suite executives, constituted a total possible sample population of around 200. In addition, 10 CEOs of the approximately 50 organisations associated with the airline industry were added to the possible sample population as they had independent insights to contribute. These organisations included the IATA, the AFRAA and regional trade associations, such as the AASA.

All respondents were weighted equally. Pre-set conditions for the sampling strategy were as follows: the demographics of the participants in terms of their chief executive positions in an airline or associated organisation, and their wide dispersion across the continent.

In terms of sample size, Burns and Grove (2009:361) posited that the sample size; 'should be large enough to identify relationships among variables or determine differences between groups'. By these criteria, the final sample size of 20 was considered to be sufficient as it provided for three or four respondents, across both public and, where available, private airlines across the primary African regions, as well as associated trade organisations, and associations (such as IATA and AFRAA).

A key consideration as to the size of the sample related to the participants' geographical location within Africa, with four broad regions being identified, as well as the non-geographically defined category of industry associations:

1. West Africa: This region is characterised by the lack of a strong hub, limited routes, particularly the fragmented nature of the air transport industry and the high failure rate of new airline start-ups (Nikitas et al. 2017).
2. East and Central Africa: This region has two strong hubs in Addis Ababa and Nairobi, and a strong state-owned airline in Ethiopian airlines (Kenya Airlines 2017; Mwanalushi 2017).
3. The islands of Madagascar, Reunion and Mauritius: Being island nations, these are particularly dependent on air connectivity (ICA 2014).

4. Southern Africa: This has the most liberalised air service environment in Africa (IATA 2016b).
5. Industrial bodies such as the IATA and regional airline associations.

A key limitation of the sampling technique was the accessibility of the chief executives in terms of time and cost considerations. Balancing ideal sample size against limited accessibility determined the study's sample size of three or four executives from each group. A further sampling refinement was the need to consider the two key ownership models, so as to include both state-owned airline and privately owned airline CEOs. A further unavoidable consideration was the cost and time difficulties of gaining access to airline CEOs in terms of time, distance and cost. The net result of the considerations in obtaining access to the CEOs was that a number of interviews were conducted as and where the chief executives were encountered – often on the side-lines of industry conferences. Convenience was thus an important part of the sampling technique but nonetheless access to a broad range of airline industry CEOs was achieved.

The determination of a sample size of 20 was based on the following considerations: The criteria were set prior to selecting sample elements. These criteria required the participants to (1) be a CEO or an acting CEO; (2) have been in that position for a minimum of 1 year; and (3) possess expertise, knowledge and skills in the broader airline industry. Participants who satisfied the above conditions and were available and accessible during the study were eventually selected using non-probability convenience and purposive sampling techniques.

While a purely random probability sampling strategy may be preferred to reduce the risk of sampling bias, the need for selecting participants who had the necessary insights and experience to provide valuable information required a non-probability sampling strategy.

Data collection

The collection of data was from four primary sources: (1) a review of the literature relevant to the African air transport industry, (2) industrial reports, (3) an identification of the key components of transport connectivity models and associated metrics, and (4) semi-structured face-to-face interviews (not online or virtual) with the heads of African airlines and industrial bodies. On the basis of insights derived from the literature review on the limitations of the African airline industry and the analysis of industry reports and the relevant key components of connectivity models, data were collected from 20 semi-structured interviews, of which 16 were usable. The interviews were conducted with airline CEOs before the COVID-19 pandemic. The data obtained from these four sources are as follows.

Literature review data

The literature published up to April 2020 relating to key aspects of the sub-Saharan airline industry was surveyed to

frame and then analyse the identification of a broad set of challenges and associated limitations of the African airline industry. It is recognised that state-owned airlines and private sector airlines may hold divergent views. These often differing or conflicting perspectives were consolidated to form a master list of challenges, which was used to generate a list of prompts for the semi-structured interviews, which form a key part of the primary research of this study.

Industry reports

The broad overview of the key challenges facing the industry provided by the literature review laid the groundwork for an analysis of the key industry reports identified for use in this study. These reports are useful as they contain information that specifically addresses the challenges faced by sub-Saharan airlines, and in one case provided a very helpful list of proposed remedial actions, which was included in the master list of challenges. In addition, there have been many reports published in industry journals and periodicals which reproduce, often almost verbatim, conference keynote speeches which specifically address the African air transport industry's challenges, and again these were then included in the master list of challenges.

Analysis of connectivity models

A number of conceptual methodologies for modelling transport connectivity were reviewed. The key components of the models were identified and added to the master list of challenges. For example, two of the key models that were examined were the ACI (Arvis & Shepherd 2011), which provided the key components of air connectivity, being: the number of O-D connections, seat availability and flight frequency. Similarly, the Air Liberalisation Index (WTO 2006), provided the key components of the deregulation and liberalisation of passenger air service through, for instance, the liberalisation of bilateral air service agreements.

Face-to-face interviews

Chief executives of airline and associated organisations were interviewed using an interview protocol with a set of pre-designed open-ended questions as discussion prompts. The challenges facing the industry identified from the review of the literature and industry reports on developments and trends in the aviation industry were used to inform these interviews.

Pre-testing of the study

As part of the quality assurance process, this study conducted a pilot study (eds. Lapan, Quartaroli & Riemer 2011) using the Likert scale to refine the list of challenges generated by the literature review for their application as interview prompts. The pilot study was administered to four industry experts, whose anonymity was assured. None were, or had been, airline CEOs. In order to avoid repetition of responses, pilot study participants were informed that they would not be part of the final study.

Data collection

The primary research component of this study was based on semi-structured interviews. Interview questions focussed on identifying the challenges and possible interventions that could be implemented to remediate the aviation industry in Africa. A specific objective of the interview protocol was to elicit opinions, not only on the importance of the challenges discussed but also on their relative importance. Thus, some challenges may have been very important – such as the need for the liberalisation of the airline industry – but others may have been more urgent, for example, the reduction of input costs such as passenger taxes and ground handling fees. While the interviews were conducted before the COVID-19 lockdown, it is readily observable that the need for the reduction in fixed costs became all the more relevant with the worldwide grounding of airlines because of the COVID-19 lockdown and the lack of revenue to cover fixed costs.

Data collection protocols

Due cognisance was provided to the relationship between the researcher and participants, which needed to be 'agnostic'. Basing the interviews on the Clandinin and Connelly (2000) precept of the 'respectful and curious inquirer' elicited a number of unexpected but rich insights. In this regard, the narrative interview was seen as collaborative, in that the researcher collaborated with the interview subject to draw out information being presented and to develop the possible fresh perspectives.

Secondary data analysis

The data from the three secondary data sources, namely (1) the literature review, (2) industry reports of conference proceedings and (3) analysis of the selected connectivity models discussed earlier, were thematically analysed. After the removal of duplications, this yielded 318 possible challenges.

The data from the review of the literature were further categorised into six categories: Economic; Government and Political; Legal and Regulation; Management; Market and Environment; and Remedial actions. The data sourced from the three sources other than the interviews may be depicted as shown in Table 1.

The interviews did not necessarily follow the order of the prompt questions and, where deemed appropriate, discussions were allowed to deviate. Interview subjects were encouraged to describe in their own words their feelings, beliefs and experiences of the industry's ability to overcome the identified challenges, and thus deliver improved connectivity.

From the literature review, industry reports and analysis of connectivity models, a master list of challenges was derived and then refined by removing duplications (e.g. quasi-

TABLE 1: Analysis of themes identified from non-interview sources (secondary data).

Source	Review of Literature	Industry reports	Connectivity models
Category			
Economic	28	106	47
Government & Political	24	-	-
Legal and Regulation	13	-	-
Management	19	-	-
Market and Environment	21	-	-
Remedial actions	13	47	-
Totals	118	153	47
		318	

Source: Leitch, G.D., 2020, *A Conceptual Framework of Air Connectivity to address the allocation of resources to African Air Transport*, Unpublished PhD Thesis, Da Vinci Institute, Johannesburg

synonyms such as liberalisation and open skies), and by combining some challenges into single factors (e.g. inability to compete against the Gulf-3 super-connectors and fear of foreign competition).

The filtering and combining process produced a list of 85 possible challenges for the face-to-face interviews. Where necessary, verbs or adjectives were added to explain the factor. Thus, 'passenger taxes' was expanded to become 'high passenger taxes'. In order to make the list useful as prompts for the interviews, these factors were classified into five broad categories of challenges, plus one category of urgent remedial actions.

Ethical considerations

Ethical clearance was obtained from the Da Vinci Ethics Committee on 17 September 2019. The face-to-face interviews were conducted from the list of ethically approved, pre-prepared prompts. The following key ethical issues were specifically addressed: informed consent of participants, ensuring no harm to participants, protection of personal information, ensuring that permission is obtained, and confidentiality of field notes.

Data analysis

Thematic data analysis was conducted on the transcribed interviews to identify the seven most important challenges indicated by the interview subjects, as well as a 'Single Most Important Priority' question to identify the most important challenge. The responses identified from the 'Single most important priority' responses were weighted. The thematic analysis process enabled the researcher to decipher themes and prioritise the emerging industry challenges.

The open-ended discussion enabled a broad prioritisation of the challenges. In total, 390 possible challenges had been identified and tabulated by the researcher. Manual thematic analysis was performed whereby 22 themes were initially identified by categorising the data. These 22 themes were then itemised alphabetically on a Thematic Analysis capture sheet whereby the 390 identified challenges were allocated to one of

the 22 themes. However, as the thematic analysis progressed, it became apparent that additional themes were needed, resulting in a final total of 29 themes. Of the 390 challenges reviewed, all but five were amenable to allocation to one of the 29 themes.

Thematic analysis

This study used thematic analysis, described by Daly, Kellehear and Gliksmann (1997), as a method to identify themes or patterns of meaning within the datasets. The coding method used for the thematic analysis corresponded to Braun and Clarke's (2006) reflexive approach that coding precedes theme development and themes are built from codes. This was the case in this study when it became clear that additional themes were required. Braun and Clarke (2006) made a clear distinction between a code and a theme, in that a code can capture one or more insights which may then be combined into themes.

The application of the responses to the thematic codes for the resultant 29 themes is depicted in Figure 1.

Triangulation of data

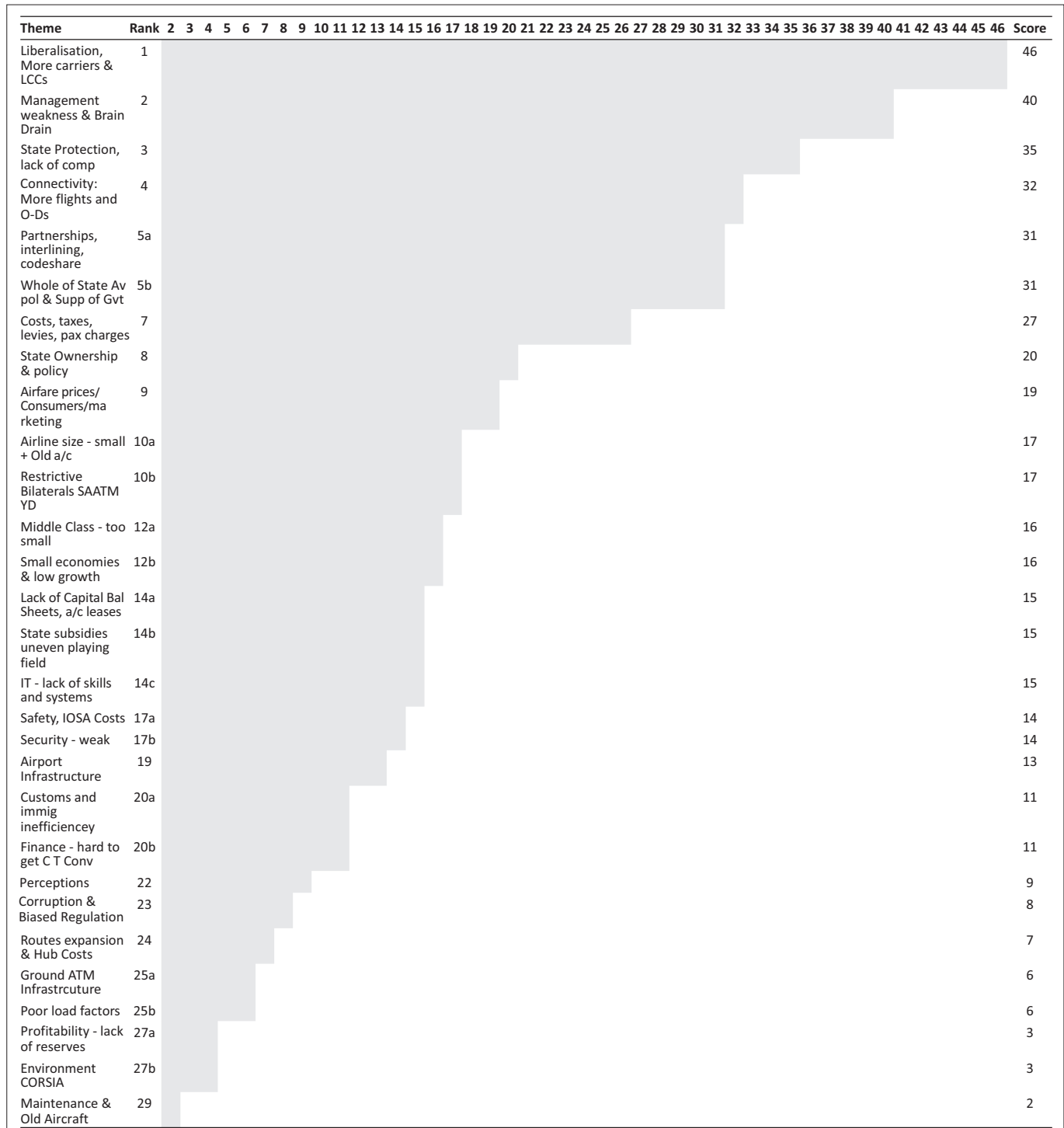
O'Donoghue and Punch (2003:78) defined triangulation as a 'method of cross-checking data from multiple sources to search for regularities in the research data'. This definition is apposite for this study as the researcher compared data from three different sources, namely the literature review, industry reports and the analysis of selected connectivity models, with the results of the face-to-face interviews. This in effect triangulates data from four different sources and methodologies, and in so doing both helps to confirm the subjective insights gained from the interviews and adds to the body of knowledge comprising the study's prioritised listing of challenges.

Discussion of results

The broad methodology employed for the identification and prioritisation of the challenges faced by the sub-Saharan airline industry are shown in Figure 2.

The top seven themes identified from the three 'non-interview' sources, namely the literature review, industry reports and the analysis of connectivity indices, are discussed and compared with the findings from the face-to-face interviews.

In terms of an overall analysis of the congruence between the four data sources, it may be concluded that there is a large degree of alignment between the four data sources, with the case-specific exception of the analyses of the connectivity models, which are narrowly focussed and thus not able to consider many of the broader themes and challenges. The level of support of the rankings from the face-to-face interviews is useful in that it helps to confirm the validity of the insights gained from the interviews and the thematic analysis technique adopted.



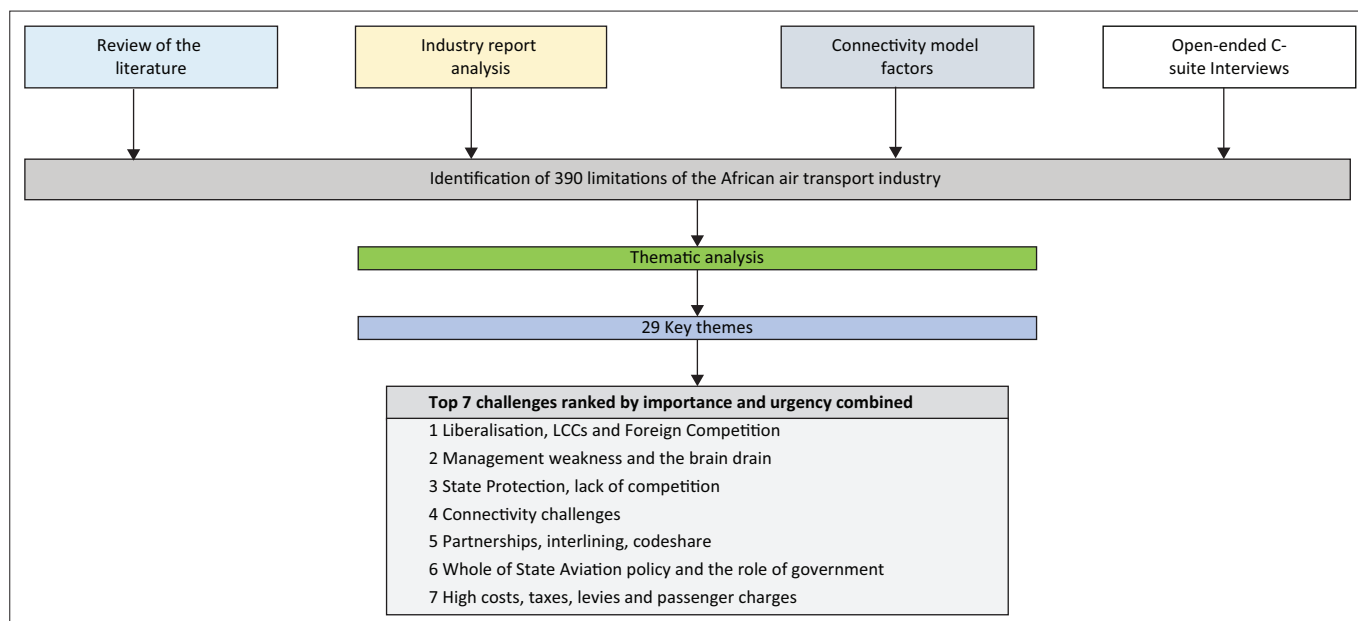
Source: Leitch, G.D., 2020, *A Conceptual Framework of Air Connectivity to address the allocation of resources to African Air Transport*, Unpublished PhD Thesis, Da Vinci Institute, Johannesburg

FIGURE 1: Data: Ranked synoptic histogram of theme application – All four data sources.

Having four data sources and being able to triangulate them was useful for this study, in that it mitigated the bias which is synonymous in qualitative research. This enabled a high level of confirmability. Furthermore, triangulation was relevant because there were issues that were better clarified by the industry reports or by presentation in conference proceedings, which were not fully addressed during interviews or contained in industry reports. This then enabled a holistic picture of the challenges confronting the African air transport industry to be derived.

Challenge 1: Liberalisation, low-cost carriers and foreign competition

This theme refers to the challenge of the need for increased liberalisation of the air traffic market in Africa, the rise of low-cost carrier (LCC) airlines and the threat of foreign competition from larger, better capitalised airlines. This was the highest ranked theme from the review of the literature, with 20 occurrences for code application. In the industry reports it ranked second, with 14 code applications. Perhaps



Source: Leitch, G.D., 2020, *A Conceptual Framework of Air Connectivity to address the allocation of resources to African Air Transport*, Unpublished PhD Thesis, Da Vinci Institute, Johannesburg

FIGURE 2: The process used to derive the identified seven challenges.

surprisingly, it was ranked seventh in the analysis of connectivity model components, with just one code application. In terms of the methodology, this can be attributed to just a single code arising from an entire model, namely the Air Liberalisation Index. However, liberalisation was ranked number 1 in the face-to-face interviews by a large margin, particularly due to the weighting factor arising from the high priority it was given by the participants.

Challenge 2: Management weaknesses and the brain drain

The second most important challenge identified was the issue of management weakness and the 'brain drain' of talent from the sub-Saharan airline industry to more developed countries. This theme was ranked fourth from the review of the literature. However, it emerged strongly from industry reports with 18 code applications. There were no mentions of this theme in the analysis of the connectivity indices, which was to be expected as there is no air connectivity model for the analysis of management weaknesses. In the face-to-face interviews, this theme was ranked fourth equal to the challenge that is the small scale of airlines and their reliance on both small gauge and older airliners.

Challenge 3: State protection of their national airlines

The theme ranked third was that of the challenge inherent in state protection of their national airlines, the associated uneven playing field and stifling of competition. This was the dominant theme in the review of the literature, attracting 17 coding applications. Perhaps surprisingly, it only attracted six coding applications from the industry reports. This may be attributed to conference speakers largely having been drawn from national airlines, and thus being reluctant to acknowledge the 'uneven playing field' of

state protection. In the face-to-face interviews, this theme was ranked eighth equal.

Challenge 4: Connectivity challenges

The fourth-ranked theme is that of the broad challenges associated with meeting the requirements for air connectivity improvement. As noted, this may appear to be circular in that the challenge identifies the challenge. However, in this case it relates to the inputs required for improving connectivity. These include air traffic management investment and airport and infrastructure investment. The challenge arises from the thin air routes and low loads, as well as low-ticket affordability. This was perhaps surprisingly ranked low in the thematic analysis of the literature, gathering just two code assignments. However, it emerged as a strong theme in the industry reports, with 13 code applications. And it was perhaps not surprisingly a key theme in the analysis of the connectivity models in that it is explicit in many of the models, particularly the ACI, (Arvis & Shepherd 2011). This theme was ranked eighth equal among the face-to-face interview participants and when aggregated with the other three data sources, it ranked fourth overall.

Challenge 5: Airline interlining, partnerships and codesharing

The challenge ranked equal fifth is the need to bulk up airlines in order to attain the critical mass to enable the economies of scale necessary to compete with non-African based carriers. This requires African carriers to expand their networks by feeding and de-feeding their routes through partnerships, interlining and code sharing. This theme attracted nine code allocations from the literature review and nine from industry reports. This theme was ranked sixth equal in the face-to-face interviews, attracting 11 code

applications, which put it on a par with the challenge of high costs, taxes, levies and passenger taxes.

Challenge 6: A whole-of-state aviation policy and the role of government

This challenge differs from Challenge 3, in that Challenge 3 refers to state protection of their own national carrier, while this challenge refers to the entire government apparatus supporting air travel through, for instance facilitating visa availability at airports and marketing the country as an attractive tourist or investment destination. In this regard, it is non-airline specific as it favours the entire airline industry and not just the protection on one state-owned airline. An unusual aspect of this theme was that it attracted only 10 coding applications from the review of the literature. In the industry reports, however, it was significant in that it attracted 16 applications. Perhaps unsurprisingly, it only attracted one possible thematic allocation from the review of the models as none of the analysed models dealt specifically with government policies and support for the aviation industry through strategies such as a whole-of-state aviation policy. It is also noteworthy that the face-to-face interviews rated the support of government and a whole-of-state aviation policy as a low priority, with just one code allocation. However, the combined totals of the four data sources made it the sixth ranked overall priority.

Challenge 7: High costs

The theme ranked seventh overall from all four data sources was that of costs, taxes levies and passenger charges. This challenge was only ranked 13th across the other three data sources, being the literature review, industry reports and connectivity models. However, in the interviews it ranked sixth, equal to the challenge of partnerships.

Summary of key findings

The findings from all four data sources in response to the first question included the following seven most important challenges that need to be addressed:

1. The need for liberalisation: This theme refers to the need for increased liberalisation of the air traffic market in sub-Saharan Africa, the rise of LCCs and the perceived threat of foreign competition from larger, better capitalised airlines.
2. Management weakness: the concern is management weakness and the 'brain drain' of talent from the sub-Saharan airline industry to more developed countries.
3. State protection of its own airline and the suppression of competition. This relates to state protection of their national airlines, the associated uneven playing field and stifling of competition.
4. The need for better air connectivity. This refers to the broad challenges associated with meeting the requirements for air connectivity improvement, which include air traffic management, airport and infrastructure investment.
5. The need for more partnerships, interlining, alliances and code sharing. The need to bulk up airlines in order to attain the critical mass to enable the economies of scale necessary to compete with non-African-based carriers.

6. There is a need for a 'whole-of-state aviation policy' supported by the government for the broader airline industry, and not just its own state-owned airline. This challenge refers to the entire government apparatus supporting air travel through, for instance, facilitating visa availability at airports and marketing the country as an attractive tourist or investment destination.
7. The reduction of costs, taxes, levies and passenger charges. Africa has some of the highest levies and taxes on airfares.

Strengths and limitations

The strengths of this study are that it (1) proposed a systematic and synoptic methodology for the analysis of the challenges facing the sub-Saharan airline industry, (2) used three sources of secondary data to inform an interview protocol for open-ended questions for use in semi-structured interviews with airline industry chief executives, and (3) was able to gain access to 20 airline industry chief executives to obtain their first-hand experiential insights into the challenges their own airlines face – as well as their insights into the broader African air transport industry.

This study was initially designed for a sample of 12 face-to-face interviews; however, it conducted 20. It may nonetheless be argued that a possible limitation for this study was the sample size of 20, which was restricted to the convenience sampling of sub-Saharan airline chief executives. Approximately 15% of the interview findings were excluded from the analyses as the subjects turned out to have too limited knowledge of the broader industrial challenges, in that they had either been recently appointed as acting airline CEOs or had a narrow specific focus – such as cargo operations. A further limitation was the limited amount of time available for the interview as the CEOs were often time constrained.

Another limitation was the concern for confidentiality as, despite the ethical clearance and confidentiality assurances, there was, at least in one case, a concern that the information the CEOs provided may be obtained by competitors and thus imparting the information may not meet with the approval of the CEO's boards of directors.

Implications of the study

The key implications of this study in terms of policy development and implementation by industry practitioners are that policymakers of the sub-Saharan airline industry may use the list of prioritised challenges to motivate intervention strategies in order to improve their own airline's ability to meet demands. The revelation from the study prompts management at different African airlines to introspect and strategise to remain competitive, especially in the aftermath of the COVID-19 pandemic.

Recommendations

It is recommended that in order to improve the capacity of the African air transport industry to meet the demand for

air transport to support economic growth, the following actions should be performed:

1. A plan of action may be proposed for adoption by an industry body such as AFRAA to address the key challenges faced by the broader African air transport industry.
2. This plan of action may take as its starting point the challenges that were identified and then prioritised by this study
3. Policymakers and programme managers may then commission a data-gathering exercise to determine the key connectivity metrics associated with the most important challenges.
4. Using a project management approach, remediation strategies to address the challenges may be implemented, and the progress and results are monitored.

Conclusion

This study addressed the question of what interventions would be the most urgent to improve the African air transport industry's ability to meet the demands of African economies for air transport. The study identified a set of challenges facing the industry and confirmed the relevance of these challenges by using them as prompts for a survey of CEOs of sub-Saharan airlines. Twenty-nine challenges were identified and ranked. In this study, the seven most important challenges to connectivity are as follows: liberalisation, management weakness, state protection and lack of competition, connectivity, partnerships, and whole-of-state aviation policy.

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Competing interests

The authors declare that no competing interest exists.

Authors' contributions

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Data availability

All data sources are listed in the paper's references and are, to the best of the principle author's knowledge, still available.

Disclaimer

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