GOVERNANCE NETWORK ON AVIATION SAFETY: A SYSTEMATIC LITERATURE REVIEW

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Abstract

The governance network serves as a crucial conceptual framework to be applied within the context of air transportation policy, particularly concerning aviation safety. This study aims to conduct a systematic literature review of prior research focusing on governance networks in the aviation safety sector and to elaborate on the existing knowledge landscape, identify prevailing research gaps, and formulate pertinent implications for future investigations. The review relies on a systematic literature review comprising 67 publications from the Scopus database. The review process adheres to the PRISMA method, wherein data from each article are categorized and documented in worksheet format. This approach facilitates systematic data grouping and subsequent descriptive and thematic analysis. The result from the review reveals a significant body of prior research about governance networks within the aviation context, predominantly in Europe and the United States. Research on networks and governance in the aviation sector has been underway since 2004. However, research explicitly applying the concept of governance network within the aviation context remains somewhat limited. Over 18 years, only 19 relevant articles have been identified. Furthermore, applying network governance concepts in aviation safety contexts is an underexplored area, with only ten articles focusing on this aspect. These findings underscore substantial opportunities for further research in the future.

Keywords: governance network, PRISMA, Scopus, aviation sector, systematic literature review
Introduction

The examination of governance and network-related research within the Scopus database has been ongoing since the 1970s. However, studies specifically focusing on these aspects within the realm of air transportation or aviation have only begun to appear in the Scopus database since 2004. The literature review in this research employs the systematic literature review (SLR) method, a valuable tool for identifying, interpreting, and evaluating prior research pertinent to a specific research question, phenomenon, or topic (Lame, 2019; Vega et al., 2018; Watson, 2019). The SLR approach treats literature reviews akin to empirical research, striving to enhance transparency and replicability, and mitigate potential researcher bias in the literature review process (Lame, 2019; Watson, 2019).

In the aviation context, collaboration among various entities plays a pivotal role in executing aviation activities within national and international network. Key stakeholders, including airlines, airport authorities, air navigation service providers, aircraft maintenance facilities, aircraft manufacturers, and educational institutions, assume significant roles in implementing the standards and regulations mandated by governments in the aviation industry. Aviation standards and regulations, encompassing aviation safety aspects, have been defined by the International Civil Aviation Organization (ICAO), an international body operating under the United Nations auspices. Within this context, all ICAO member states must adopt and adhere to the standards and regulations established by ICAO to ensure aviation operational safety.

Furthermore, the implementation of aviation safety standards also involves various additional entities. For instance, in the case of aviation accidents, the National Transportation Safety Committee (KNKT) plays a pivotal role in investigating and analyzing such incidents. Nations often engage in cooperative relationships to collectively enhance resources and expertise in the aviation sector. Regional and international aviation organizations, such as the European Aviation Safety Agency (EASA) in the European Union, aim to promote aviation safety in their respective regions. Additionally, the International Air Transport Association (IATA) serves as an association that accommodates international airlines and contributes to setting standards for operational practices and safety. These organizations, alongside other vital actors, collectively contribute to the holistic maintenance and enhancement of safety in the aviation industry.

The governance network serves as a crucial conceptual framework to be applied within the context of air transportation policy, particularly concerning aviation safety in this research. This choice is underpinned by the intricate involvement of aviation stakeholders in implementing the national aviation safety program in Indonesia. Governance networks, widely utilized to address complex public issues, are defined as a conglomeration of actors from various organizations, whether public, private, or nonprofit, engaged in interactions on local, national, and international scales (Riche et al., 2021). These networks emerge in response to the imperative of collectively achieving specific objectives that cannot be attained independently (Riche et al., 2021; Torfing et al., 2014). Consequently, conducting a Systematic Literature Review (SLR) on governance networks in the aviation domain emerges as a vital endeavor.

In light of the background provided, several questions arise within the scope of this research. Firstly, how are the concepts of networking and governance within the aviation industry defined and comprehended? Secondly, within the framework of governance networks in the aviation sector, how are the relationships among the involved entities designed and managed? Thirdly, can the governance network be identified and analyzed using current research findings in aviation safety? Lastly, what are the key aspects warranting attention in future research endeavors to understand and enhance governance networks? This review contributes to elaborating the existing knowledge landscape, identifying prevailing research gaps, and formulating pertinent implications for future investigations on governance network in aviation sector, specifically in aviation safety.
Methods

Systematic Literature Review (SLR) is a pertinent approach for organizing existing knowledge on the concept of governance networks in the holistic context of the aviation industry, with a specific emphasis on aviation safety. The methodology employed in this SLR follows the PRISMA technique, which stands for 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (Page et al., 2021; Riche et al., 2021; Zurynski, 2014). The PRISMA approach offers a structured framework that guides the transparent presentation of the SLR, encompassing search procedures, article selection, criteria for inclusion and exclusion, data analysis methods, and guidelines for presenting SLR findings (Page et al., 2021; Riche et al., 2021).

The scope of this SLR encompasses two research domains, namely public administration, and aviation. In the field of public administration, the focus centers on the concept of network governance, while in the aviation domain, the attention is directed towards aviation safety aspects. This review encompasses all studies indexed in the Scopus database up to October 2022, with a specific focus on titles, abstracts, and keywords using the search criteria: "(governance AND network AND (aviation OR "air transport"))".

Following an initial keyword search, 67 articles of various types, including research articles, conference papers, book articles, conference review articles, and books, were identified. In formulating selection criteria, the following initial considerations were considered: First and foremost, the selection prioritizes articles directly related to networks, governance, and governance networks within the context of public administration, as depicted in Figure 1.

**Figure 1. Literature selection flow diagram with PRISMA**

Search results from Scopus database (n=67)

Selection results based on title, abstract and keywords (n=32)

Selection results included in the review (n=19)

Analyses through close reading

Selection criteria
- Not a peer reviewed journal article
- Not an English language article
- Not an article in the final publication stage

Selection criteria
1. Articles not in line with the theme of networking and governance or governance networks in aviation
2. The article cannot be downloaded because the journal is no longer available

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This prioritization involves closely examining article titles, abstracts, and keywords. Subsequently, articles addressing aspects of air transportation or aviation, including safety issues, are included while adhering to the overarching themes of networking and governance. Furthermore, preference is given to articles authored in the English language and those that have undergone a rigorous peer-review process in academic journals. Ultimately, our selection encompasses articles that have achieved the final publication stage without imposing limitations based on the publication year.

Following the selection criteria encompassing the evaluation of titles, abstracts, and keywords, 32 documents have been filtered for further consideration after a comprehensive review. Notably, the two articles proved unobtainable as they were solely available in abstract form. Further investigation unveiled that both were published in journals that were no longer accessible online or had been discontinued. Upon completing a comprehensive review, it was ascertained that 11 articles lacked relevance to the concept of governance network within the aviation context. Consequently, these eight articles were excluded from the systematic literature review (SLR). The themes present in these articles were diverse, encompassing health, biology, and technical aspects of aviation, and some of them did not constitute research articles but scientific commentaries and literature review articles. Thus, 19 articles were identified as candidates for further scrutiny in the literature review process to address the predetermined research questions.

Results and Discussions

In the context of this literature analysis, a review encompassing 19 articles from diverse multidisciplinary journals, including Public Administration, Transportation, Engineering, and other fields, is undertaken. Notably, these articles are derived from distinct journals, with the majority affiliating with Transportation, totaling five articles. All evaluated articles enjoy a recognized reputation within the Scopus index, with a significant proportion falling within the Q1 and Q2 categories, indicative of their standing and impact in academic discourse, as depicted in Figure 2.

Concerning the historical evolution of the topic under discussion, the first articles addressing network aspects and governance within the aviation industry emerged as early as 2004, spanning 18 years to the present. 2018 and 2021 marked peak periods of attention to this subject, with three articles published each year, as illustrated in Figure 3.

Furthermore, in the analysis of research methodologies employed, it is worth noting that approximately 68% of these articles apply qualitative approaches, rendering it the most prevalent method. Quantitative methodologies occupy the second position, representing around 21%. The remaining 11% employ mixed methods, as elucidated in Figure 4. This analysis affords valuable insights into the predominant research approaches underpinning the examination of this topic.
This study identifies three distinct categories of research findings pertaining to the research focus. Firstly, there exist articles that delve into the concepts of networks and governance separately within the field of aviation. Secondly, there are articles that expound upon the concept of governance networks as a universal framework applicable to the aviation context at large. Lastly, the third research finding centers on the facets of governance networks that are exclusively examined within aviation safety, aligning closely with the core issue under scrutiny in this Systematic Literature Review (SLR).

The concepts of network, governance, and governance network in the aviation sector

In the context of our initial research scope, the concepts of aviation networks and governance encompass a broad spectrum of aviation-related facets. Our reference articles span a range of topics, including infrastructure networks, airport networks, information collaboration, information technology networks, CCTV surveillance systems, and Air Traffic Management (Fuellhart et al., 2021; Große et al., 2021; Lootens & Efthymiou, 2019; Lykou et al., 2019). Furthermore, historical discussions have been presented in other articles, examining the evolution of wireless networks within the aviation context, the integration of transportation infrastructure with aviation, airline networks, and resource networks among aviation stakeholders (Adler et al., 2014; Casanueva et al., 2013; Givoni & Chen, 2017; Rikitianskaia et al., 2018). Additionally, there are articles addressing inter-airport agreements with municipal authorities (Cidell, 2006).

Furthermore, a total of seven articles delves into the discourse of network governance in the aviation domain. Several of these explicitly reference concepts such as 'network governance' (Baker et al., 2012; Sager et al., 2004) and 'policy network' (Bloch et al., 2021; Sager et al., 2004). Meanwhile, other articles employ specialized terminology commonly utilized in the network governance context, including 'multi-stakeholder participation,' 'support from diverse actors,' and 'interests and initiatives from various parties' (Henriksen & Ponte, 2018). There is also a noteworthy emphasis on the representation by non-governmental entities, multi-stakeholder interests, and the engagement of diverse stakeholders with varying interests and active involvement (Addie, 2014; Donnet et al., 2018).

The latest research conducted by Bassi (2020) scrutinizes explicitly issues related to intergovernmental coordination, the role of the drone industry in regulation, market integration, and legislative aspects. This study further elaborates on the concept of collaboration as a key element in network governance, particularly within the framework of rule implementation involving EASA, member states, and competent authorities, to facilitate the exchange of information and resources. More detailed insights regarding the concept of network governance in the aviation industry context can be found in Table 1.

<table>
<thead>
<tr>
<th>Articles /Author(s)</th>
<th>The concepts of governance networks</th>
<th>Actors/institutions</th>
<th>Aviation field</th>
<th>The examples of governance networks citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Baker &amp; Donnet, 2012)</td>
<td>Network governance</td>
<td>Airlines, 3R (rural, regional, remote) airports, both private and government-owned, federal government agencies, Australian airport associations, local</td>
<td>Airport</td>
<td>The development of a more network governance approach in this case has improved relationships on both sides of the airport fence. (Pg.42)</td>
</tr>
</tbody>
</table>
government bodies, and local aviation communities

| (Addie, 2014) | Policy network | The government, non-governmental organizations, a diverse array of stakeholders, and professionals. | Airport | model of airport governance. First, the Board of Directors provides representation for governmental and non-governmental bodies that defend the interests of multiple stakeholders. (Pg. 94) |
| (Sager & Ravlum, 2004) | Network governance, Policy network | Ministry, public entities, local governments, and markets. | All aviation field | The co-ordination following from the participatory form of network governance promotes efficacy, meaning desirability of the outcome. |
| (Donnet et al., 2018) | Aviation network | the state, regional authorities, local government bodies, governmental agencies, airports, communities, primary stakeholders, and private sector entities | All aviation field | The interconnected nature of the State's aviation network means that a network-level strategy would be beneficial to generating dialogue between regions. It would set network-level agendas that would help the Queensland Government better engage with Queensland's aviation industry and the public. |
| (Henriksen & Ponte, 2018) | Infrastructure of collaboration and coordination | experts, stakeholders, industry representatives, governmental bodies, universities, and professionals | All aviation field | public authority can (or should) work to bridge possible gaps between different groups of public, private, and civil society actors and/or work to shape established positions to new realities. |
| (Bassi, 2020) | Collaborative model of enforcement | The European Commission, EASA (European Union Aviation Safety Agency), member states, national authorities, industry stakeholders, and experts | Airport, ANSP, airlines | Over the past ten years, experts and stakeholders have been involved in public consultations by the E.U. institutions, as to how to change the then status quo. |
| (Bloch et al., 2021) | Airport governance, Policy network | airlines, airports, local stakeholders, residents, government ministries, destination country authorities, and the broader community | Airport | the importance of taking stakeholder involvement seriously and considering it a continuing feature of an airport governance model, rather than a one-off, ad hoc addition to an airport’s strategic planning |

**Governance network on aviation safety**

In aviation safety research, the application of governance network concepts commenced in 2011, focusing on the European Aviation Safety Agency (EASA) operating under the European Union. Notably, this study is rooted in two pivotal articles’ scholars (Saurer, 2011; Schout, 2011). These seminal works center their attention on EASA, which, in its nascent stages, operated under an indirect administrative model. This framework indirectly assigned responsibility for aviation safety policy implementation to member states. Over time, a transformative shift occurred, leading to a more interconnected governance network model comprising three distinct forms: the European agency itself, the institutionalization of national authorities in a network, and open coordination mechanisms. EASA's portfolio also includes the issuance of
certifications, encompassing individual, organizational, and environmental domains.

Saurer's research delves into the accountability framework within the European agency's administration. EASA's involvement in a complex network implicates supranational accountability to the European Council, Commission, and Parliament, and involves various societal actors. However, despite EASA's pivotal role, it remains subject to criticism from member states, exemplified by the United Kingdom's call for governance, management, and resource reforms within EASA before extending its support and additional resources.

In another study by Schout, a comparative analysis was undertaken between the European Aviation Safety Agency (EASA) and the comitology system, along with its predecessor institutions, utilizing a legitimacy framework. This research elucidated that EASA, in its inception, did not operate as an independent authority. Instead, it evolved from collaborative efforts involving academic institutions, traditional E.U. bodies, and network structures. EASA transformed the aviation safety framework from a less transparent structure into a more open bureaucracy designed to represent better public interests than its precursors (Schout, 2011).

Furthermore, EASA exhibited the potential to add value by facilitating learning through the distribution and discussion of inspection reports among national aviation safety agencies. Schout's research also expounded on the concept of accountability as a crucial mechanism that distinguishes input and output in the context of legitimacy. Accountability was defined as a set of rules established to ensure alignment between delegating and receiving authorities, encompassing various monitoring mechanisms aimed at organizational oversight and fostering public trust through transparent decision-making processes (Schout, 2011).

In the framework of this legitimacy model, governance entails a set of interrelated accountability mechanisms, which encompass hierarchical control, administrative oversight, official supervision, and functional collaboration. Notably, the European Aviation Safety Agency (EASA) continues to operate committee structures, such as the EASA Committee responsible for discussing regulations implemented by the European Commission, and the Aviation Safety Committee, which addresses politically sensitive issues like aircraft blacklists and international cooperation on aviation emissions (Schout, 2011).

Schout highlights the historical evolution of aviation, reflecting a significant shift from national cooperation to the European regulatory framework. EASA, established in 2003 to serve as an independent authority, has, in practice, maintained collaboration with national aviation authorities, particularly due to the specialized expertise and supervision requirements essential for major airports. This underscores the critical role of consultations, partnerships, and networks in fulfilling EASA's aviation safety responsibilities (Schout, 2011).

In the context of Federal aviation safety governance networks, the 2018 study by Mills shifts its attention from EASA to FAA. This study explores accountability dynamics in the U.S. government's changing governance framework, which is moving toward a process-oriented regulatory framework. To facilitate this shift, public, commercial, and nonprofit players must participate in the supervision, compliance, and monitoring tasks carried out by government organizations. From the diverse views and interests of the participating parties, such a transformation holds essential consequences for accountability (Mills et al., 2018).

The FAA has embarked on the development of voluntary cooperation programs with aviation companies and labour unions to enhance inspection activities and encourage violation reporting. This approach facilitates the identification of potential hazards and trends while fostering a safety culture within the aviation industry. However, aviation companies face intricate trade-offs in terms of accountability, given their unique objectives, such as safety, which may conflict with regulatory goals. Additionally, the substantial reputation risks for companies and the industry at large are significant factors that must be considered.

This research adopts a governance network accountability framework, which
identifies three types of accountabilities: democratic, market, and administrative. In the context of the FAA (Federal Aviation Administration), the role of the aviation industry in aviation safety emerges as a form of collaboration involving pilots and airline company labour unions. The FAA’s voluntary disclosure program reflects the structural collaboration within this network, with airline companies and labour unions working together to identify and address safety hazards. However, this collaborative accountability also has the potential for limitations, particularly if regulators and legislators do not maintain a balance with other accountability mechanisms, such as process-based regulation or bureaucratic accountability. Alignment and trust among all stakeholders are crucial in preserving balanced accountability within the aviation safety regulation governance network.

The examination of governance networks in aviation safety, as undertaken by the aforementioned scholars, primarily centres on accountability. Discussions on accountability structures within governments have been extensive, spanning from Robert Dahl's analysis of democratic structures and norms in the 1940s to Maas and Radway's elucidation of governmental responsibilities (Koliba et al., 2019). Furthermore, the comparative analysis of accountability within both EASA and FAA aligns with Papadopoulos's research in 2021, emphasizing the importance of comparative studies to discern factors influencing various dimensions of the accountability process (Ansell et al., 2022).

Conclusion

The increasing complexity of the world environment highlights the critical requirement for the establishment of governance networks as a key strategy in tackling public concerns in various sectors, including the aviation industry. Particularly the aviation sector has enormous obstacles that need for cooperation and assistance from a range of stakeholders. In this regard, the idea of a governance network takes on great importance in including several stakeholders in the creation of efficient and successful aviation policies.

This systematic literature review examines the academic discourse that has evolved around network and governance concepts in the aviation context. Through our analysis of the literature, three distinct categories of studies emerge. Firstly, network and governance concepts are concurrently applied, although these are often treated as distinct constructs in the analysis. Secondly, some approaches seamlessly integrate both concepts within the framework of governance networks, as applied within the aviation domain. Lastly, some studies primarily concentrate on applying governance networks, particularly within aviation safety. Of the 19 articles surveyed addressing aspects of networking, governance, and governance networks in the aviation realm, nine fall within the first category, seven adopt the second approach, and the remaining three primarily center their focus on aviation safety aspects.

In the context of aviation, the application of network and governance concepts tends to concentrate primarily on the physical aviation network aspects. In the alternative approach, the governance network concepts, such as network governance, policy networks, aviation networks, infrastructure of collaboration and coordination, collaborative models of enforcement, and airport governance policy networks, assume central prominence. Previous research has encompassed three analyses that adopt the network governance concept within the realm of aviation safety. They all share a common focus on the accountability of actors involved in governance networks pertaining to aviation safety. Two articles delve into the accountability of actors representing supranational bodies, such as EASA, while one article centres its attention on the accountability of all involved actors, including government entities like the FAA and aviation companies.

Drawing upon the comprehensive examination of pertinent literature, a discernible overview of prior research endeavours in the realm of aviation policy
analysis, particularly within the European and American contexts, emerges. The outcomes of this literature review unveil several pertinent findings. Firstly, studies pertaining to network and governance dynamics in the aviation sector have been in progress since 2004, as documented within the Scopus database. Notwithstanding, research that employs the concepts of network and governance in the aviation context remains relatively scarce. Over the span of 18 years, merely nineteen relevant articles were identified. Furthermore, the utilization of network governance concepts, specifically focusing on aviation safety, remains limited, with only ten articles explicitly addressing this aspect. From a general perspective, it can be inferred that research employing network governance concepts within the realm of aviation safety is rather modest. The primary focus of these studies centres on the scrutiny of the accountability of various actors involved in aviation governance networks.

Secondly, these findings offer avenues for further exploration, delving into diverse sub-concepts that are yet to be fully explored by scholars and academics. For instance, potential research endeavours could centre on the patterns of interaction among the myriad actors within aviation governance networks. Additionally, research may contemplate administrative network frameworks or models that encompass both vertical and horizontal dimensions, an area that presently remains a conceptual challenge with insufficient attention in network governance studies.

References


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