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Determinants of Airport Vulnerability to Security and Safety. A Case of Jomo Kenyatta International Airport, Nairobi

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Abstract:

Airport security and safety have in most instances been affected by criminal activities, resulting in far-reaching consequences in the air transport industry. Although airports across the world have put in place measures to deter security and safety vulnerabilities, most still suffer huge losses because of safety and security threats. This paper explores the determinants of airport vulnerability to security and safety at Kenyan airports, with a focus on Jomo Kenyatta International Airport, Nairobi. Specifically, the paper focuses on external and internal determinants of airport vulnerability to security and safety at the airport of study. Using a descriptive research design and a sample of 296 respondents drawn from a target population of 1140, this study established various external determinants, including supportive stakeholders in the security and safety protocols at the airport, proper implementation of security protocols and measures by the airport operators, and periodic training of staff on safety and security, which have positively influenced the security and safety at the airport. In addition, this study established that internal determinants have strongly influenced the safety and security of the airport. Airport management has put measures in place to reduce airport vulnerability to security and safety, including putting in place appropriate security policies and measures, equipping security personnel with required safety and security gadgets, and undertaking periodic training for staff on safety and security. The paper concludes that both internal and external determinants have positively influenced the security and safety achieved through supportive stakeholders, effective implementation of security and safety protocols, and periodic training of staff on safety and security. This study recommends that airport management should invest heavily in procuring modern security and safety equipment for security personnel and develop evidence-based policies and best practices whose implementation will foster security and safety at the airport. The airport management should also closely monitor the implementation of all security and safety protocols and undertake periodic training, inspections, and audits on safety and security matters to mitigate security risks at the airport.

Keywords: Security, safety, airport vulnerability, internal and external determinants

Introduction:

Airport security is one of the most important aspects of the air transport industry (Pièrre-Cambacédès & Bouissou, 2013). In particular, airport security became a global concern after the recent major attacks on aviation security in September 2001, where the security of the air transport industry was challenged. Although these attacks had a big impact on aviation security,

criminal attacks on airport security are not new. According to Nolan (2014), the first criminal attack dates back to May 1930, when Peruvian revolutionaries hijacked a Pan American mail plane. In 1933, the first recorded bombing of commercial aircraft took place, which is thought to be the first proven act of air sabotage in commercial aviation. Although the first attacks date back to the 1930s, the birth of aviation security was caused by the mass of aircraft hijackings in the 1960s. Due to these hijackings, the International Civil Aviation Organization (ICAO) legal committee was instructed to develop international conventions to deal with the security of aviation, which led (at the Tokyo Convention) to the start of aviation security (ICAO, 2022).

Given the nature of aviation operations, safety and security risks have particular relevance in airports. Extensive literature has been produced in the attempt to elaborate agreed definitions for safety and security, in particular, in the field of critical infrastructure protection (Avizienis et al., 2004; Burns et al., 1992; Nolan, 2014; Piètre-Cambacédès & Bouissou, 2013; Piètre-Cambacédès & Chaudet, 2010; Schoitsch, 2005). A common factor for all airports is that they are vulnerable to operational failures, which in turn have the potential to escalate into full crises. Events such as the September 2001 terrorist attacks and the Moscow airport terrorist attack in 2011 directly hit airports or the aviation system at large. All of these occurrences have poignantly highlighted the importance and necessity for airports to manage their level of vulnerability to operational risks.

The International Civil Aviation Organization is a global airport authority that is established to ensure security and safety in the airspace and also at airports (ICAO, 2021). Many aviation organizations have started campaigns for airport security and safety, which were triggered by massive records of several incidents in the past. Security and safety challenges affecting airport security have led the ICAO to declare 2021 the year of security concern globally (ICAO, 2022). Effective reiteration and quick responses to security lapses within the airport can save many lives globally. Despite airport security being a civil security phenomenon and a matter of great concern, balancing the needs of passengers and enhancing the security of airports becomes a major challenge for the airport management team. The growing concerns about terrorist attacks produce both public and official demands for exceptional security measures (Gierlach et al., 2010).

Airport security and safety have been highly affected by criminal activities, resulting in far-reaching consequences for the air transport industry. Although airports across the world have put in place measures to deter security and safety vulnerabilities, most still suffer huge losses because of safety and security threats. In Kenya and the majority of African nations, the degree of effective application of air safety standards and recommended practices has remained below the global target, despite global targets having been adopted throughout time. Jomo Kenyatta International Airports have invested heavily in advanced security systems, which have positively enhanced the security of the airport infrastructure, passengers, and employees. The complexity of the problem of safety and security in the aviation sphere is also preconditioned by the fact that the number of security threats increases every year due to the advancement of technology. The rise in security threats led to a deterioration of airport safety and security.

However, existing literature lacks comprehensive studies addressing the whole spectrum of safety and security events potentially occurring in airports. Security and safety are complex phenomena involving a large range of instances, with limited research investigating them in an all-encompassing way (Enoma & Allen, 2007; Enoma et al., 2009). Complete inventories of safety and vulnerabilities in airports are missing in the literature. There is a need to explore the individual and organizational factors of vulnerability, namely the practices, attitudes, and behaviours exhibited at airport organizations that present the potential causes of vulnerability; explore the nature of safety

and security risks common at Jomo Kenyatta International Airport (JKIA), Nairobi; and establish both internal and external factors of airport vulnerability, especially considering the physical and institutional complexity of airports. These factors range from human to technical (Carayon, 2006; Carayon & Smith, 2000; Kraemer & Carayon, 2007) and characterise airports as complex socio-technical systems (Camastral, 2014; Devine, 2014). Therefore, this study sought to investigate the determinants of airport vulnerability to security and safety at JKIA Nairobi, with a focus on both external and internal determinants.

Statement of Problem:

The Kenyan airport industry has been under immense pressure over the past few years with regards to the security and safety of staff and passengers at large, despite being one of the most important aspects of the air transport industry. Jomo Kenyatta International Airport has invested heavily in advanced security systems, which have positively enhanced the security of the airport infrastructure, passengers, and employees. The complexity of the problem of safety and security in the aviation sphere is also preconditioned by the fact that the number of security threats increases every year due to the advancement of technology. The rise in security threats led to a deterioration of airport safety and security. Given the nature of aviation operations, safety and security risks have particular relevance in airports. Despite precautions taken to prevent security and safety flaws, Jomo Kenyatta International Airport has continued to experience some trends of security threats emanating from cyber-attacks. The study found that dissemination of information among stakeholders was average, resulting in challenges in cooperation and response in cases of emergency. Therefore, this study assessed factors influencing the vulnerability of airport security and safety at Jomo Kenyatta International Airport, Kenya.

Methodology:

This study employed a descriptive survey research design. According to Kothari (2004), a research design is the arrangement of conditions for the collection and analysis of data to combine the relevance of the research purpose and the economy of the procedure. This design was appropriate since it provided the study room to explore and pull out, among other things, employee views on the factors influencing the vulnerability to security and safety at the airport under study.

The study was conducted at the Jomo Kenyatta International Airport in Nairobi, which is Africa's premier hub and an ideal gateway into and out of East and Central Africa. The choice of this site is informed by the fact that, being an international airport, the security threats associated with it are immense and that a study on JKIA will present a better microcosm of the problem under investigation. The study targeted the 1140 employees at the airport, from whom a stratified random sampling technique was utilized to draw a sample of 296 respondents. In addition, a purposive sampling technique was used to select 11 key informants to help cross-check the information given by respondents.

The methods of data collection for this study were a questionnaire and a key informant interview. The questionnaire was used to collect information from the 296 respondents. The method was used because the sample size was too large to collect data using other data collection methods. The nature of the questions contained in the questionnaire gave the respondents the freedom to decide on the form, detail, and length of their answers. A key informant interview guide was used to collect information from experts to help cross-check information given by respondents. The key informants were 11 high-ranking security officers at the airport, which included 5 senior airline officials, 1 senior airport employee, and 5 senior police officers.

The collected data was interpreted and analyzed thematically, and the results were presented in tables with the help of descriptive statistics, namely frequency and percentages. Conversely, content analysis techniques were used to analyses qualitative data. The analyzed qualitative data was presented in the form of quotes and verbatim.

Results and Discussions:

External Determinants of Airport Vulnerability to Security and Safety at JKIA Nairobi, Kenya.

The first objective of this study was to assess various external determinants that influence airport vulnerability to security and safety at JKIA. Findings from this study revealed there were several determinants or factors that trigger the security and safety of the airport. Findings from this study established that poor cooperation between multiple owners and operators within airports was a factor that contributed to the hindrance of airport safety and security. The study deduced that stakeholder involvement affected airports vulnerability to safety and security. It is clear that the implementation of effective airport safety and security is closely dependent on the strong and healthy engagement of different stakeholders. This study revealed that the airport's security and safety were seriously compromised. This resulted in exposing the airport infrastructure, employees, passengers, and their belongings to security risks at the airport.

Findings from this study ascertained that cyber-attacks were another external determinant of the vulnerability of airport safety and security. This demonstrates that the failure of the security management team to identify and manage cyber security risks resulting from outside attacks will be a big problem for airport security on a regular basis. This challenge has created a negative reputation for the airport's image. Airports are referred to as a prime target for cybersecurity attacks since they are an essential component of a nation's infrastructure.

Internal Determinants of Airport Vulnerability to Security and Safety at JKIA Nairobi, Kenya.

The second objective examined internal determinants of airport vulnerability to security and safety at JKIA Nairobi, Kenya. This study established that the nature of security policies and measures influences the vulnerability of airports to security and safety. Findings from this study reveal that applications of screening and access control devices and software were not fully utilized, thus creating loopholes that can be easily exploited, hence putting the airport at risk. Findings from this study established that the airport security systems lacked the capability to conduct advanced screening of passengers and luggage due to a lack of advanced screening equipment. Poor screening and tracking devices expose the airport infrastructure at large to security threats, thus limiting the airport's ability to check for security threats in time. Finally, this study established that airport security personnel were equipped with security equipment of the latest technology.

Findings from this study affirm that the installation of free internet and Wi-Fi services within airports has a positive impact on passengers. This study also established that the installation of free internet and Wi-Fi services strongly contravenes airport safety and security. This was revealed by the existence of rogue access points in the network, which provided open access to malicious attacks from different uncontrolled networks. Airport staff wrongly exhibit cyber threats from viruses and licenses accessed through uncontrolled networks. Free internal services trigger the majority of criminal attacks to upload malicious viruses and software with the intention of interfering with the effective security system of the airport. In conclusion, the findings of this study were justified by Nwasonuba and Okendo (2021), who highlighted various factors such as poor screening of travellers and a lack of advanced technology, which created loopholes and exposed the airport infrastructure to security threats.

Controls in Place to Mitigate Security and Safety Vulnerabilities Common at JKIA Nairobi, Kenya.

Finally, the third objective established various control measures employed by the airport management to mitigate security risks within the airport. This study concludes that without proper mitigation measures, airport security systems will be at risk due to their vulnerability to being exploited by attackers from different dimensions. This study found that employees at the airport are aware of the safety and security risks at the airport

due to constant training and communications from the security department.

This study established that the airport security team's efforts had a favourable impact on the security and safety of airport operations. Findings from this study established that the airport management team has ensured that private companies working within the airport are subjected to frequent audits and inspections on security and safety. This ensures that all various departments within the airport are subjected to heightened security control through regular audits and inspections of private companies working within the JKIA.

Findings from this study reveal that airport management authorities conduct comprehensive auditing and quality assurance of all security aspects within the airport. This study revealed that frequent audits and regular inspections would ensure that all private organizations working within the airport would adhere to all security standards put in place. This ensures that the security and safety of airport users are guaranteed since compressive audits and inspections are conducted by the competent authority.

Findings from this study established the need to use advanced technology, especially 3D screening and surveillance equipment, biometric technology, and tracking devices, to enhance effective protection of airport security and safety for staff, passengers, and even infrastructure. This would enhance the mechanism put in place to combat insecurity threats within the airport premises. This study established that the use of advanced technology, especially screening and monitoring systems, would help detect security threats. The use of modernized technology was linked to the government's recent decision to provide funding for the modernization of airport infrastructure and systems.

Findings from this study were justified by Lykou et al. (2018), who claimed that airports are at the forefront of the employment of modernized and advanced technological innovation systems. The findings of this study were in agreement with Boholm et al. (2016), who contend that as sophisticated security gear and software continue to advance, there is a corresponding need to look for ways to make operating procedures simpler for a variety of security personnel. Finally, the findings from this study were in line with Kanyi et al. (2016), who argue that frequent training of security personnel at the airport reduces security and safety risks.

Conclusion:

This study established that the main role of the airport security team is to ensure maximum safety and security for employees, passengers, and the airport infrastructure. A security lapse could lead to massive and catastrophic impacts and the destruction of infrastructure, resulting in human and financial losses. Effective implementation and reiteration of security risks within the airport regularly can save many lives and improve the security and safety of the airport.

This study reveals that much effort and attention are required to address both internal and external determinants of the vulnerability of airport safety and security. This study found that it is crucial to integrate both public and private aviation security initiatives on a worldwide scale to ensure aviation security and safety. By doing this, efforts to identify, discourage, avoid, and even eliminate security threats would be coordinated to the greatest extent possible, thereby lowering vulnerabilities. KCAA promotes the use of a thorough and coordinated effort, including all stakeholders, to align the strategies of aviation safety and security programmers.

This study concludes that KCAA should enforce effective mitigation strategies to prevent massive destruction, thereby promoting expedited recovery as well as minimizing the impact of security on the aviation security system. Security threats can be prevented and protected effectively through the application of maximum efforts. Resiliency and response efforts on airport security threats help to minimize the consequences of a disruption within the airport security system and even the economy of the country.

Last but not least, this study found that airport safety and security have been one of the most crucial and complex aspects of the aviation industry. Given the existence of various strategies employed by various security agencies within the country to address tightened security concerns, airport security management should put more effort and emphasis on prioritizing stringent safety and security measures that cover passenger screening, access control, surveillance systems, and collaboration from various stakeholders globally. Most Kenyan airports have been striving very hard to invest in and implement advanced technologies such as explosive detection systems, biometric scanning, and 3D surveillance equipment to enhance security.

Recommendations:

Recommendations are given based on the study objective. In order to establish effective and implement controls in place to mitigate security and safety vulnerabilities common at JKIA Nairobi, the study recommends that:

1. Airport management should ensure effective implementation of all international and local safety and security protocols and procedures by various operators in the airport to guarantee conformance and consistency of the existing security and safety protocols and procedures. Effective implementation of the safety and security standards requires maximum cooperation and the application of collective capabilities from all airport domains. This will enhance the aviation safety and security framework both domestically and internationally.
2. This study recommends the incorporation of a unique layered defence system and fusion detection technology for each for quality detection and response to cyber-attack threats. The airport management should invest heavily in acquiring advanced modern security and equipment's, screening and access control equipment's, and even use of the latest security applications to control and prevent cyber-attacks within the airport security systems. This will promote airport safety and security frameworks both locally and internationally through constant innovation and the deployment of active and layered security systems.
3. There is a need for the JKIA to ensure periodic training of employees and even periodic inspections and audits on safety and security for all operators to identify security and safety gaps at the airport. This study recommends that training on safety and security issues should be extended to all employees of other departments and even to passengers on board. This will help to create awareness and share knowledge on how to handle various security threats at different levels without the assistance of qualified personnel.

References:

1. Avizienis, A., Laprie, J., Randell, B., & Carl Landwehr, C. (2004*). Basic concepts and Taxonomy of Dependable and Secure Computing*. USA, Iowa State University.
2. Boholm, M., Möller, N., & Hansson, O. (2016). The concept of risk, safety, and security:applications in everyday language. *Risk Analysis, 36(2*), 320–338.
3. Burns, A., McDermid, J., & Dobson, J. (1992) On the Meaning of Safety and Security. *The Computer Journal, 6*(35), 3-15.
4. Carayon, P. (2006). Human factors of complex socio-technical systems. *Appl Ergon, 37*(6), 525 - 535.
5. Carayon, P., & Smith, M. (2000). Work organization and ergonomics. *Appl Ergon, 31*(6), 649-662.
6. Camastral, M. (2014). *Business continuity management in airports: securing continuity in the face of crisis.* Australia, Queens land University of Technology.
7. Devine, M. (2014). *Risk management and high reliability: a case study of Australian*

airport Management. Australia, Queensland University of Technology.

8. Enoma, A., & Allen, S. (2007). Developing key performance indicators for airport safety and Security Facilities. Aviation Safety Journal, 25(8), 296-315.
9. Enoma, A., Allen, S., & Enoma, A. (2009). Airport Redesign for Safety and Security: Case Studies of Three Scottish Airports. *International Journal of Strategic Property Management, 13*(2), 103-116.
10. Gerlach, E., Belsher, M., Beutler, E., & Larry, E. (2010). Cross-Cultural Differences in RiskPerceptions of Disasters: Cross-Cultural Differences in Risk Perceptions of Disasters. *Risk Analysis, 30*(10), 1539–1549.
11. ICAO. (2022). *Annex 17 to the Convention on International Civil Aviation. Security*. Montreal, Canada: International Civil Aviation Organization.
12. Kanyi, P., Kamau, P., & Mireri, C. (2016). Assessment Of the Security Preparedness and Adherence to International Civil Aviation Standards at Wilson Airport, Kenya. *Journal of Humanities and Social Science, 21(3)*, 23-41.
13. Kraemer, S., & Carayon, P. (2007). Human errors and violations in computer and information security: The viewpoint of network administrators and security specialists. *Appl Ergon, 38(2*), 143-154.
14. Kothari, R. (2004). *Research Methodology Methods and Techniques (2nd Edition*). New Age International Publishers, New Delhi.
15. Lykou, G., Anagnostopoulos, A., & Gritzalis, D. (2018). Implementing cyber-security measuresin airports to improve cyber resilience. *Global Internet of Things Summit, 1*(6), 305–310.
16. Nolan, P. (2014). *Safety and Security Review for the Process Industries: Application of HAZOP,PHA, What-IF and SVA Reviews (3th ed.).* Norwich, William Andrew Publisher.
17. Nwasonuba, O., & Okendo, N. (2021). An Evaluation of Security in the Nigerian Airports. *African Journal of Business and Economic Development, 1*(5), 30-43.
18. Piètre-Cambacédès, L., & Bouissou, M. (2013). Cross-fertilization between safety and security engineering. *Reliability Engineering & System Safety, 110* (1), 110-126.
19. Piètre-Cambacédès, L., & Chaudet, C. (2010). The SEMA referential framework: Avoiding ambiguities in the term's "security" and "safety". *International Journal of Critical Infrastructure Protection, 3*(2), 55-66.
20. Schoitsch, E. (2005). Design for Safety and Security of Complex Embedded Systems: A Unified Approach in Cyberspace Security and Defense. *Research Issues, 196*(1), 161-174.