A Secure Framework for Khartoum International Airport in Accordance with for International Airport Standards

[1]Prof. Ahmed Slah Abdalalla, [2]Dr. Imad Mohammed Alsayid Abdalla

[1]Manager of Academic Programs, Open University of Sudan, Sudan

[2]Manager of General Programs, Delta College for Science and Technology, Sudan

Abstract - **The problem of the study is that the Sudanese international airports suffer from the application and development of international standards by bringing them to the ground and the process of evaluating them, this is a result of the scarcity and lack of specialized Sudanese experts in the field of applying, auditing and monitoring international standards at airports, as the positive image of the Sudanese people must be reflected by spreading their cultures through the Sudanese international airport portal, while the aim of the study is to Establishing Secure Framework for Khartoum International Airport, and to clarify the current situation of the Sudanese international airports, and what global airports have achieved in applying global standards, knowing that the study methodology is the methodology of systems analysis and design, and in the study tools, the enterprise Architect program was used in the analysis of UML diagrams, and the XD Design program in the design of the study, and in the implementation it used the Android Studio package, the results of the study were in determining the proposed a new security framework for KIA, which includes the standards to be applied in Sudan's international airports, as well as the criteria for the nature and specificity of its environment and its distinctive geographical location in the African and Arab map, and the recommendations of the study lie in developing and sending an integrated Sudanese team that works on developing and implementing international standards, and spreading Sudanese cultures around the world.**

Keywords: Secure Framework, International Standards, International Airports, Information Security, Performance assessment.

I. INTRODUCTION

The problem facing by Sudan in recent times is the suffocating economic crisis which is taking place these days, The origins of these economic problems are directly related to the failure to adopt security and peace standards in the country, which leads to a lack of customer demand for services provided by Khartoum International airport.

The failure to adopt international security standards at Khartoum International Airport this leads to a lack of trust from all sides of passengers, airlines and partners.

With the adoption of international standards, there is no guarantee of business success and there will be no increases in expected profits in the future, the failure to adopt these standards also indicates that the security aspects are not the company's priorities.

So in this research we will solve the problem through the adoption of a set of state standards and we will compare these standards and choose from them what fits with Khartoum Airport.

The international standards of British, French and American standards are followed by a set of local standards for the Khartoum International Airport, However, if the company relies on Khartoum International Airport not to adopt the international security standards, this is not to accept the services provided to the public beneficiary and this leads to a decline in material revenues, high percentage of security violations, and increase electronic attacks attributed to the weakness of infrastructure, and therefore will not contribute to the decline in revenues to increase national income The individual does not even contribute to the economic growth of the Sudanese Contrary.

1.1 Research Problem

I think in Sudan, we surfing from several issue about how to Manage the International Airport, and airline, how the Management Structure of International Airport must be, this fact a beer clearly in last year's, so the main problem in this research are:

- Current International Airport in Sudan don't follow international standard in real fact.
- Our individual income in Sudan it's very limited, so if we applied International standard in Sudan at airport, I think that gain befts to us in our country, and directly enhance the individual income.

- The lack of experience Sudanese people in field of Airport Standards, so we really live that to outsource to do that.
- We need to reflect the negative Image about Sudanese Nation in the word, through our International Airport Culture.

1.2 Objectives of research

Establishing a Security Framework for Khartoum International Airport in accordance witch international Standards to protect Sudanese airport from threats that may harm a lot.

1.3 Methodology

The methodology of research contains four component is Identify, Detect, Assess, preform, in details:

Level One: *Identify* to select the standards are adopt IN our Secure Framework is ISO/IEC, BS, SS, LS, Level Two: *Detect* all process in international airport environment is checked, Level Three: *Response* to inside environments like internal Auditors and from outside environments as Solution Providers, Partnerships, suppliers, and External Auditors, Level Four: *preforms* to reflex the change that we adopt to implement and managed at international airport environments.

The tools used the in research is Android Studio package in programming phase, Enterprise Architect in analysis phase, XD Design in Design phase in the practical application of the analog interactive model, the study concluded to adopt 42 studies out of 92 studies.

II. LITERATURE REVIEW

In paper [1] [2] [3] [4] [5] Incheon International Airport (IIA) has been rated as the one of the world's cleanest airports and highly rated international transit airports by Skytrax together with Singapore Changi Airport and Tokyo Haneda Airport, as of 2020, Haneda was rated by Skytrax as the 2nd Best Airport after Singapore's Changi Airport, and is the World's Cleanest and Best Domestic Airport.

In paper [6] [7] Singapore Changi Airport it's currently rated the World's Best Airport by Skytrax, the first Airport in the world to do so for eight consecutive years.

In paper [8] [9] [10] [11] Singapore Changi Airport it's the one of the world's cleanest airports and highly rated international transit airports, In 2019, Changi served 68.3 million passengers, making it the 18th busiest airport in the world, and the airport has won over 620 awards since its opening, including 28 "Best Airport" awards in 2019 alone.

In paper [12] [13] [14] Haneda handled 87,098,683 passengers in 2018; by passenger throughput, it was the third-busiest airport in Asia, THA, it will be able to handle 50 million passengers per year, although some estimates suggest the airport could handle up to 93 million per year, making it the second largest airport in the region after Dubai, IIA in the world's 19th busiest airport by passenger traffic and ninth in Asia, In 2019, the airport served a total of 70,857,908 passengers.

In paper [15] [16] [17] [18] [19] SCA Terminal 5 is set to be ready in the mid 2030s, It is expected to handle 50 million passenger movements per annum, Terminal 5 project could be delayed by at least 2 years as a result of the COVID-19 pandemic, THA, On 25 June 2007, the two governments concluded an agreement allowing for the Haneda-Hongqiao service to commence from October 2007, THA In June 2007, The airport allows departures and arrivals between 11 pm and 6 am, as Narita Airport is closed during these hours.

In paper [20] [21] [22] [23] [24] [25] [26] SCA, in 2019, Firefly, the sole turboprop operator in Changi Airport, moved to Seletar Airport to make way for their jet operations, SCA In 2020, due to the ongoing COVID-19 pandemic, passenger traffic fell 32.8% due to the weakened demand for February. For the next few months, it is estimated that the numbers would drop further, a THA spokesperson said that they would work with transportation operators and the government to improve the situation, Hamad International Airport finally began passenger operations on 30 April 2014, with ten initial airlines operating, IIA The system was planned to be introduced in Terminal 2, but in May 2015 Incheon Airport used one of the counter islands for the unmanned luggage handling system.

In paper [27] [28] [29] [30] [31] SCA Air Cargo Division of the Changi Airport Group (CAG) manages the Changi Airfreight Centre, SCA Air Cargo World awarded the 2013 Air Cargo Excellence Award to Changi Airport for handling more than 1,000,000 tonnes of cargo in Asia, SCA In 2017, the airport handled 2,125,226 tons of cargo. The top five cargo markets for the airport were China, Australia, Hong Kong, United States and India, TCA An expansion of the new international terminal was completed at the end of March 2014. The expansion includes a new 8-gate pier to the northwest of the existing terminal, an expansion of the adjacent apron with four new aircraft parking spots, a hotel inside the international terminal, and expanded check-in, customs/immigration/quarantine and baggage claim areas, HIA Steering Committee awarded the contract for the development of the airport to Bechtel. The contract includes the design, construction management and project management of the facilities.

In paper [32] [33] [34] HIA Cargo operations began from 1 December 2013, with an inaugural flight by Qatar Airways Cargo arriving from Europe, IIA, On 15 November 2006, the Airbus A380 landed at the airport as part of the first leg of its certification trip, IIA Estimated to be completed in 2020, this is the final and the ultimate construction stage. Upon completion, the airport will have two passenger terminals, four satellite concourses, 128 gates, and five parallel runways.

In paper [35] [36] SCA In 2018, Indonesia was the largest market for the airport, followed by Malaysia, China, Thailand, Australia, India, Hong Kong, Japan, Philippines and Vietnam. Kuala Lumpur was the top destination for travelers in the airport, followed by Bangkok, Jakarta, Hong Kong, Manila, Denpasar/Bali, Tokyo, Ho Chi Minh City, Taipei and Sydney, THA, it was the third-busiest airport in Asia and the fourth-busiest in the world, after Hartsfield–Jackson Atlanta International Airport, Beijing Capital International Airport (Asia's busiest), and Dubai International Airport.

In paper [37] [38] [39] HIA An expansion plan announced in September 2015 called for an extension of the check-in area, an expansion of concourses D and E into a 1.3 km long concourse, a new passenger amenity area in the D/E complex with lounges, shops and restaurants, IIA A new passenger terminal opened on 18 January 2018, and Korean Air, KLM, Delta Air Lines, and Air France flights were relocated from Terminal 1 to Terminal 2. Other SkyTeam members such as Aeromexico, Alitalia, ChinaAirlines, GarudaIndonesia, XiamenAir, CzechAirlines and Aeroflot started serving the

Terminal 2 on 28 October 2018, Rest of the SkyTeam members, such as Vietnam Airlines, China Eastern Airlines and Shanghai Airlines, will be relocated to Terminal 2 after the Phase 4 construction work is complete.

In paper [40] [41] [42] [43] SCA Private transport All pick-ups by private transportation occur at the arrival pick-up points of each terminal, THA, The critical facilities of the airport such as runways, taxiways and aprons are managed by Ministry of Land, Infrastructure, Transport and Tourism.[49] As of March 2013, Terminal 1 and 2 have 47 jetways altogether, HIA expansion plan, the Doha Metro was extended to the airport with the opening of the red line airport branch in December 2019, IIA, The Korea City Air Terminal in Gangnam is linked with the airport through limousine buses.

In paper [44] [45] [46] [47] SCA, In March 2008, prior to the full effect of the financial crisis of 2007–2010 on the global economy, the airport was predicted to handle 50 million passengers by 2012, THA, including beaches near the current site of Haneda, Haneda was a town located on Tokyo Bay, which merged into the Tokyo ward of Kamata in 1932, HIA Qatar Airways later blamed Bechtel for the opening delay in April 2013, citing failures to meet regulatory requirements, IIA, In November 1992, the construction of the Incheon airport began on reclaimed land between Yeongjong Island and Youngyu Island, and took eight years to finish, with an additional six months for testing. Completion was initially scheduled for 1997 but delayed due to the economic crisis; the airport was officially opened on 21 March 2001.

III. 4 TOP INTERNATIONAL AIRPORTS COMBATIVE

Table 1: Show the name of Airports, opened date, Served Passengers, Aircraft, tons of Cargo

Name of Airport	Opened on	Served of passengers	Aircraft movements	Tons of Cargo
Singapore changi Airport	1981	68.3 million	382,000 movement	2,010,000 Tons
Tokyo International Airport	1931	87,098,683 passengers	-	1,250,000 Tons
Hamad International Airport	2014	38,786,422 passengers	232,917 movement	Million tons annually
Incheon International Airport	2001	71,169,516	404,104 movement	2,764,369 Tons

Table 2: Show the name of Airports, Airport Type, Operator, Serves, Location

Name of Airport	Airport Type	Operator	Serves
Singapore Changi Airport	Public/Military	Singapore	Singapore
Tokyo International Airport	Public	Civil Aviation Bureau	Greater Tokyo Area
Hamad International Airport	Public	Qatar Airways	Qatar
Incheon International Airport	Public	Incheon Inter Airport Corporation	Seoul Capital Area

Table 3: Show the name of Airports, Elevation, Coordinates, Focus City

Name of Airport	Elevation	Coordinates	Focus City for
Singapore changi airport	7m / 22ft	10º 12'33N 103º 59'22W	Changi
Tokyo International Airport	6m / 21 ft	35º 33'12N 139º 46'52E	Singapore Airlines
Hamad International Airport	4m / 13 ft	25º 16'23N 51º 36'29E	Qatar Airlines
Incheon International Airport	7m / 23 ft	37º 27' N 126º 26 E	China Eastern Airlines, China Southern Airlines, Thai Airways.

Table 4: Show the name of Airports, Runways Direction, Runways Length, Runways Surface

Name of Airport	Runways Direction	Runways Length	Runways Surface
Singapore changi airport	02 L / 20 R 02 C / 20 C	4,000 M 4,000 M	Asphalt
Tokyo International Airport	16 R / 34 L 16 L / 34 R	3,000 M 3,000 M	Asphalt Concrete
Hamad International Airport	16 R/34 L 16 L /34 R	4,250 M 4,850 M	Asphalt
Incheon International Airport	15 R / 33 L 15 L /33 R	3,750 M 3,750 M	Asphalt

IV. SECURE FRAMEWORK STANDARD LIST

In accordance with our Secure Framework adopt, the International Standards, as flow:

4.1 Passenger Check

The set of guidelines to be followed in Passenger Standard are:

- Ensure that information receives an appropriate level of protection.
- Information should be classified in terms of its value.
- The passenger should be aware.
- What to expect when taking your carry-on bag through security screen next time you fly
- You will be asked to remove personal electronic device larger then call then a cell phone.
- We trying out ways to take passenger temperatures before they fly
- Checking include passport, paper, ticket, visa.
- Passport can check-in online starting 24 hours usual before departure
- Checking-in in person allows you to checking baggage
- A boarding pass is document provide permission to board the air phone for particular fight
- Airline require to wear masks on broad and airport office
- People to come in closer contact with other passenger

- Checking a suit case makes moves use for many people, so be careful.

4.2 Individuals Check

The set of guidelines to be followed in Individuals Standard are:

- Allocation of responsibility and roles.
- Ensure user awareness.
- Verification Checks on all candidates for employment contracts and third-party.
- Continues to have appropriate skills and qualification.
- Resistibility for employment termination.
- All employee contactor should return all the assets.
- Guidelines for eating, drinking, and smoking should be established.
- Not share individual's user passwords.
- Ensuring the safety of personals.
- Data protection and privacy information.
- Compliance with security policies and Standards and technical compliance.

4.3 Luggage Checks

The set of guidelines to be followed in Luggage Standard are:

- We recommended keeping your bag organized to help case the screening process as it takes time to made sure jam packed, cluttered.

- Checking luggage is inaccessible to the passenger during the flight or rid.
- The luggage should be limited by airline with regard to size weight and number.
- Failing which these baggages will be flagged with prohibited items.
- It's important to find out about airline riles an baggage fee before you begin packing.
- Luggage is subjected to security check.
- The use of device to wipe the bags.
- If a foreign object discovered in the luggage the police are notified.
- The passenger are notified that their luggage have been opened via card that is placed on the bags.
- Security men should wear distinctive clothes.

4.4 Procedures Check

The set of guidelines to be followed in Procedures Standard are:

- Should have procedure in place that specify when and by whom authorities.
- Should have a procedure to protect organization assets.
- Unsupervised working secure area should be avoided.
- Camera, recording, should be not be allowed, unless authorized.
- Incoming material should be inspected.
- Defined procedure deals with malicious code.
- Blocking any use of mobile code.
- Procedure for the use of wireless network.
- Establish procedure to verify the identity of user.
- Log off mainframe computer server and office PC when the session is finished.
- Access to operating system should be controlled.
- Procedure for business continuity.
- Procedure for testing input data.
- Procedure for responding to output validation test.
- Change control procedure should be controlled.
- The implementation of change should be controlled by use of formal change control procedure.
- An audit log should be kept for all procedure undertake.

4.5 Policy Check

The set of guidelines to be followed in Policy Standard are:

- The policies should be approved by management and published.
- The policies should be reviewed at planed intervals if change any occur.
- Preventive and corrective policy action.

- The policy should state management commitment.
- The policy supports the overall objective and principles.
- Policy education, training and awareness.
- Report policy incidents.
- Control should be adopted to minimize risk.
- Only authorized maintenance personal should carry out repairs.
- Sensitive data should not be copied into the test system environment.
- Should check the implementation of agreements and changes to ensure that meet all requirement.
- Back up should be stored in remote location.
- Use cryptographic techniques'.
- Access control policy should be established, documented, reviewed.
- Policies for information dissemination and authorization.
- Production of organizational records.
- Regulation of cryptographic controls.

4.6 Terminal check

The set of guidelines to be followed in Terminal Standard are:

- New terminal should have appropriate user management authorization.
- Each hardware and software should be checked to ensure that they are compatible with system components.
- Roles for the acceptable use of terminal.
- Key facilities should be site to avoid access.
- Physical protection against damage from fire, flood, earthquake.
- Such as water supply, sewage heating, and air conditioning should be regularly inspected protection.
- Power and telecommunications cabling carrying data should be protected from damage.
- Device containing sensitive information should be destroyed.
- Computer and terminal should be left logged.
- Different terminal might be connected through a security check point.

4.7 System Checks

The set of guidelines to be followed in System Standard are:

- Each particular system should be identified.
- Network cabling should be protected.
- Power cables should be segregated.
- System restart and recovery procedure for use on the event of system failure.

- Change to operation system should only be made when there is a valid business reason to do.
- Users should use different user profiles for operational and test system.
- Adoption of new products or newer versions.
- Prevented and detect the introduction of malicious code.
- Update the malicious code detection and repair.
- Check electronic mail attachments.
- Backup copies of information and software should be taken.
- Technology applied for security of network service, authentication, encryption, network connection control.
- All media should be stored in secure environment, and must be available and removable procedure.
- Appropriate authentication mechanisms are applied for users and equipment.
- User authentication for external connection.
- Sensitive system should have isolated computing environment.
- Antivirus protection and firewall requirements.
- Security of system file.
- Protection of system test data.
- Access to programs source code should be restricted.

4.8 Lighting check

The set of guidelines to be followed in Lighting Standard are:

- Lighting protection should be applied to all buildings and should be fit.
- Color full lights cover taxi was and runways to help pilots navigate the airport.
- Red, blue, green, umber, and white lights glow, flash, and race across the ground.
- Find out what colored airport lights mean and how pilots use them.
- Passenger lights often see while driving to the airport around the aircraft to the aircraft window.
- Both day and night airport lights make it easy to maneuver around the move of taxiways.
- Taxiway lights are always blue.
- Green lights in ground centerline lights are often installed at busy airports.
- The airport manager or operate is responsible for operating airport lights during the hours =s to tower is closed.
- Monitors do not indicate light securement due to snow, sand, plant growth, etc.

4.9 Building Checks

The set of guidelines to be followed in Building Standard are:

- Perimeters building or sit containing information security should be secure protected.
- Reception area to control physical access.
- Physical berries should build to prevent unauthorized individuals.
- All fir doors on a security perimeter should be alarmed, monitored, tested.
- Suitable intruder detection system should be installed.
- Secure area may be lockable office or serial rooms.
- Personnel should be granted restricted access.
- Access to area where sensitive information store is protected.
- The building should be constructed in two languages, English, Arabic.
- Must be a connected security gates in building of airports.

4.10 Access check

The set of guidelines to be followed in Access Standard are:

- Authorization levels should be clearly defined.
- Gain access to specialist security device.
- Get physical access to office, rooms.
- Get logical access to database, information.
- Access control policy like permitted access method.
- Defining and periodically reviewing access restrictions.
- Riles for electronic mail and internal usages.
- Guidelines for the use of mobile devices.
- Access rights of all employee, contractor should be removed upon termination of the employment.
- Security perimeters barriers, walls, gate, desks, should be used.
- Log information should be protected.
- Access control rules should take account of policies for information dissemination and authorization.
- Ensure authorized user access.
- Privileges should be assigned to different user id.

4.11 Fraud check

The set of guidelines to be followed in Fraud Standard are:

- Identification and recording of significant change.
- Developer tester also poses a threat to confidentiality.
- Protecting message from unauthorized access.
- Protected information in business communication system recording, conference, opening mail.
- Information in E-C Passing over public network should be protected.
- Information involved in on line transaction should be production by signatures.

- Faults should be lagged analyzed and appropriate authentications.
- Limitation of connection time should be used to provide additional security.
- Use of appropriate programs to recover from failures.
- Cryptographic controls to protect the confidentiality.
- Threat of forging digital signature by replacing a user public key.
- Out sourced software development should be supervised and monitored by the organization.
- Reporting information security event through appropriate management channels.

4.12 Process checks

The set of guidelines to be followed in this Standard are:

- Security process should be assigned.
- A process revoking access rights.
- Correct processing in application to prevent errors, loss.
- Suitable feedback processes to ensure that those reporting information security events.
- Including information security in the business continuity management process.
- Event that can case interruptions to business process should be identified.
- Appropriate education of staff in the agreed procedure and process.
- Manager should ensure that all security procedure within area of responsibility is carried out correctly.
- The process of producing your boarding passes which includes seat number, departure time and gates.
- You should aim to be at airport at least 2 hours for domestic flight it's before the scheduled departure time of your flights.

4.13 Performance check

The set of guidelines to be followed in this Standard are:

- Share and exchange information about new technologies.
- The definition of verifiable performance criteria.
- Business continuity plans should be tested and update regularly.
- To avoid breaches of any law statutory, regulation, or contractual obligations.
- Performance area of our business live up to the expectation of our passengers, partners should be at good level rate.
- The decision based on time performance and put it in own websites to build trust, no own websites to depart or arrive late.

- The one time performance has traditional been a key factor in consumers airline booking choice.
- One time if it departure arrive within 15 minutes of scheduling time shown in carriers.
- Passenger can apply of compensation when flight is delayed (25-600 Dollars) per person, navigate marks.
- You must, their performance impact on the operation airline stimulation the economic growth and maintain stability in the region.

V. RESEARCH RESULT AND DISCUSSION

5.1 Result of Research

The main research result is the international standards that must be applied to raise the Sudanese economy and thus raise the level of income for individuals were clarified and secondary result are:

- A establishes team specializing in airport standards will be formed.
- Improving the negative image of many people around the world about Sudanese donation in the extent of its attendance.
- Also define the special Sudanese standards related to the Swan environment and its culture.
- International airports are the gateway to spreading cultures around the world.

5.2 The Discussion

The Recommendations of research is A national body must be formed that works to follow up on the implementation of these international standards, and to deliver all new developments that raise the country's economic growth, and Forming a specialized team of Sudanese in applying international standards in Sudanese airports.

VI. CONCLUSION

The conclusion of this paper is to focusing spotlight on the importance of Sudanese Airport in reflecting Sudanese Cultures and Values around the world, the airport also affect the level of Sudanese National Income, and the study improve the level of airports performance as well as controlling the security aspects of Sudanese Airports, as for the outcome that be remembered, they are: Secure Framework for Khartoum International Airport, Top International airports Combative, risk minimized, compliance to international standards and practices, reliable operations, business continuity, and improved safety.

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