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Development of an AppSheet-Based Prohibited Items Reconciliation Reporting System at HB-SCP to Enhance Security at Kalimarau Airport

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ABSTRACT

Airport security plays a vital role, particularly in monitoring passenger baggage. However, at Kalimarau Airport, the current manual reporting method for confiscated items poses risks of data inaccuracy and processing delays. This study aims to design a digital reporting system for seized items using the AppSheet application connected to an online database to support data reconciliation across units. The research adopts an R&D methodology with a PPE (Planning, Production, Evaluation) approach, involving needs analysis, system development, and field testing. Evaluation involved two experts (IT and content) and five respondents from each relevant operational unit. The testing results indicate enhanced efficiency and accuracy, with expert scores of 5 across four assessment indicators and an average user score exceeding 9.68 based on the Ideal Mean and Ideal Standard Deviation scheme. The application supports real-time recording, data visualization, and automated reporting. Scientifically, the use of low-code platforms such as AppSheet enables rapid system development without complex programming skills, aligning with current trends in aviation security digitalization. This reporting system is considered feasible as a digital solution for managing confiscated items at airports, improving transparency, processing speed, and data security, and has the potential to be adopted by other airports across Indonesia.

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INTRODUCTION

Airports are essential infrastructures that support regional mobility and uphold national security standards[1] . In Indonesia, airport security must comply with national and international regulations, particularly in managing prohibited items as mandated by ICAO Annex 17 Security 2022 and ICAO Annex 18 on the Safe Transport of Dangerous Goods by Air (2011) [2][3]. Kalimarau Airport, located in Berau Regency, East Kalimantan, serves as a regional hub and is classified under Security System Level E according to Ministerial Regulation No. 9 of 2024 [4][5]. While larger airports have adopted digital systems such as panic buttons at Soekarno-Hatta and AVSIAGA at Yogyakarta International Airport to enhance security awareness[6][7]. Kalimarau Airport still lacks integrated tools to support its security procedures. This research addresses that gap by developing a digital reporting system for confiscated items at the Hold Baggage Screening Check Point (HB-SCP), aiming to enhance operational accuracy, improve coordination, and support preventive security measures through timely and structured data reporting.

Globally, airport security authorities are increasingly adopting digital tools to enhance efficiency, data accuracy, and traceability in security operations. Despite this trend, the use of *low-code* platforms in AVSEC reporting systems remains underexplored in academic research. While previous studies have emphasized physical technologies such as X-ray screening and surveillance systems, fewer have investigated lightweight digital systems that address operational reporting issues.

This study aims to address the identified gap by developing a role-based reporting application using Google AppSheet, a low-code platform that enables rapid development and user-centered customization. The proposed system supports real-time data entry, daily operational filtering, inter-unit coordination (AVSEC, airline staff, and customer service), and automated PDF report generation for supervisory purposes. Academically, AppSheet exemplifies how low-code platforms contribute to agile information system development, particularly in high-risk and time-sensitive environments such as aviation security. Its modular structure enables iterative design, cross-device compatibility, and rapid deployment—characteristics aligned with adaptive and resilient system frameworks discussed in contemporary information systems literature. The application aligns with the digital transformation efforts promoted by Indonesia's Directorate General of Civil Aviation [4].

The selection of AppSheet is also supported by previous research conducted by Kurniawan (2024), who stated that the implementation of AppSheet in the daily security reporting system at Adi Soemarmo Airport successfully improved reporting efficiency and accessibility. The system received expert validation scores with an average feasibility rating of 88.7%, categorized as "Highly Feasible.[8]" This study extends that approach by expanding the application's function to the reporting of confiscated items at the Hold Baggage Screening Check Point (HB-SCP), aiming to improve reporting accuracy, enhance inter-unit coordination, and ensure compliance with civil aviation security regulations.

METHODS

This study employs the Research and Development (R&D) method with the PPE (Planning, Production, Evaluation) model developed by Richey and Klein (2009). This structured approach is used to design, build, and evaluate a product through systematic and iterative stages [9].

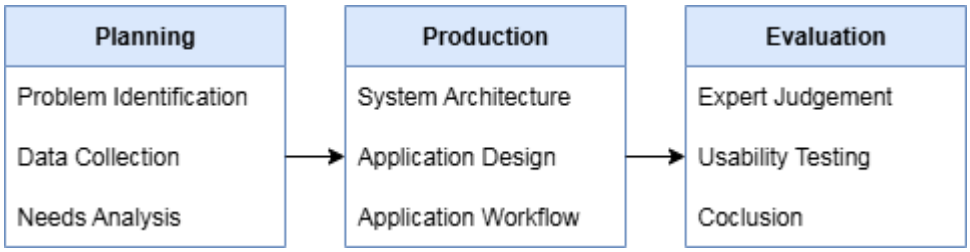


Figure 1 Model PPE

Planning Stage

In the planning phase, the researcher identified operational issues through direct observation at the Hold Baggage Security Check Point (HB-SCP) area and related units such as airline counters and the customer service post at Kalimarau Airport. Semi-structured interviews were conducted using a

purposive sampling method. The interviewees included key personnel from each unit: the AVSEC chief, airline station supervisors (Batik and Lion Air), and the customer service coordinator—who are directly responsible for the recorded baggage inspection process. Additionally, a literature review was conducted by analyzing regulatory documents such as ICAO Annex 17, ICAO Annex 18, and Indonesia's national aviation security policies, along with the reconciliation procedure document implemented at Soekarno-Hatta International Airport as a benchmark for standard practices.

Production Stage

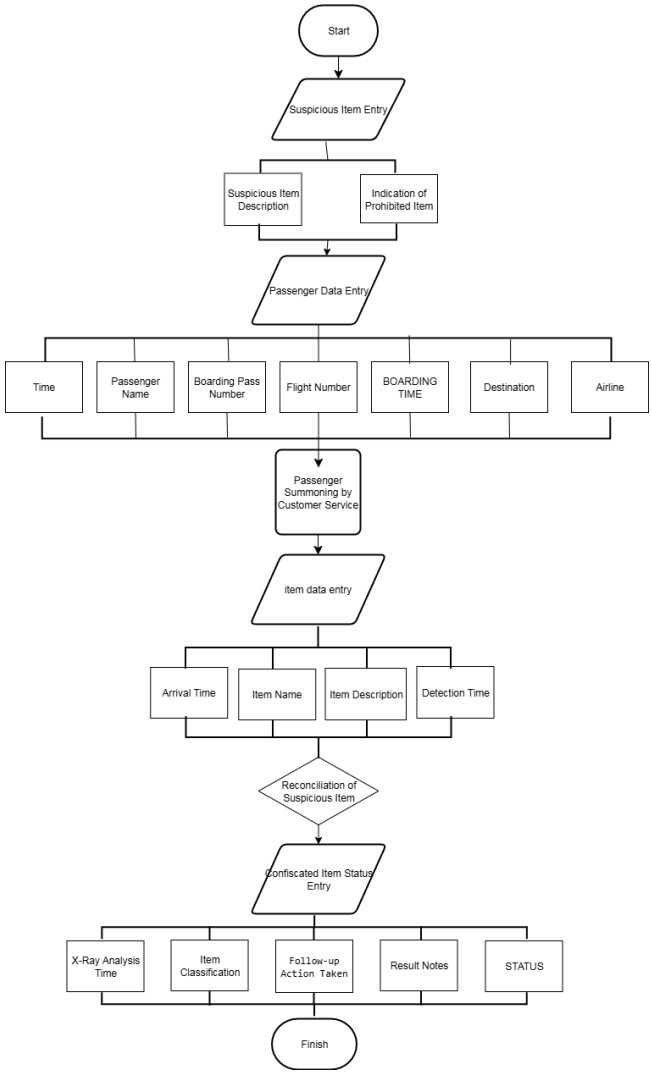


Figure 2 Design Flowchart of the ASE-R Confiscated Item Reporting System

Based on the needs analysis, a digital application was designed using Google AppSheet. This platform was selected for its no-code development environment, integration with Google Sheets, low deployment cost, and multi-role support. Compared to other low-code platforms like Microsoft Power Apps or Glide, AppSheet offered more seamless adoption for non-technical users. The system was designed with structured data tables, real-time data syncing, user role filters, and automated PDF reporting workflowsc[10]

Evaluation Stage

The evaluation phase consisted of two parts: expert judgment and usability testing. Expert review was conducted by two professionals who assessed system feasibility based on four key indicators: content relevance, Language clarity, Interface Design, and Content Readability [11]. Usability testing involved five participants representing key airport units (AVSEC, airline, and customer service) [12].The selection of five participants followed the principle of interface evaluation

efficiency. Limited availability of operational staff also influenced this decision. The usability instrument included five indicators: ease of use, task fit, efficiency work speed, visual design, and navigation convenience. All were measured using a 5-point Likert scale.

Table 1 Likert Scale

Score	Category
$\bar{x} > 4{,}2$	Strongly agree
$3{,}4 < \bar{x} \leq 4{,}2$	Agree
$2{,}6 < \bar{x} \leq 3{,}4$	Neutral
$1{,}8 < \bar{x} \leq 2{,}6$	Somewhat Agree
$\bar{x} \leq 1{,}8$	Disagree

Formula to Calculate the Mean per Aspect:

$$\bar{x} = \frac{\sum x}{N} \quad (1)$$

Descriptions :
$\bar{x}$= Mean
$\sum x$= Total Score
N = Total Category/Responden

The qualitative interpretation involves converting the average score of each aspect into categories using established criteria. The conversion uses the following reference:

Table 2 Score Conversion Criteria Reference

Score Interval	Feasibility Category
$x > xi + 1{,}80\ Sdi$	Highly Feasible
$xi + 0{,}60Sdi < x \leq xi + 1{,}80\ Sdi$	Feasible
$xi\text{-}0{,}60Sdi < x \leq xi + 0{,}060\ Sdi$	Moderately Feasible
$xi - 1{,}80\ Sdi < x \leq xi\text{ - }0{,}060\ Sdi$	Less Feasible
$x \leq xi - 1{,}80\ Sdi$	Not Feasible

Descriptions :
xi : Ideal Mean
Sdi : Ideal Standard Deviation

Based on the conversion formula above, calculations are then carried out as a reference to convert quantitative data into qualitative data as follows:

Highest score : 5
Lowest Score : 1
Ideal Mean (Mi) :

$$Mi = \frac{Highest\ Score + Lowest\ Score}{2} = \frac{5+1}{2} = 3 \quad (2)$$

Ideal Standard Deviation (SDi) :

$$SDi = \frac{Highest\ Score + Lowest\ Score}{6} = \frac{5-1}{6} = 0{,}67 \quad (3)$$

Highly Feasible :

$$Mi + 1{,}80\ Sdi < \bar{x} \quad (4)$$

$$= 3 + (1{,}8 \times 0{,}67) < \bar{x} \quad (5)$$

$$= \bar{x} > 4{,}2 \quad (6)$$

Feasible :

$$Mi + 0{,}6\ Sdi < \bar{x} \leq Mi + 1{,}8\ Sdi \quad (7)$$

$$= 3 + (0{,}6 \times 0{,}67) < \bar{x} \leq 3 + (1{,}8 \times 0{,}67) \quad (8)$$

$$= 3{,}4 < \bar{x} \leq 4{,}2 \quad (9)$$

Moderately Feasible :

$$Mi - 0{,}6\ Sdi < \bar{x} \leq Mi + 0{,}6\ Sdi \quad (10)$$

$$= 3 - (0{,}6 \times 0{,}67) < \bar{x} \leq 3 + (0{,}6 \times 0{,}67) \quad (11)$$

$$= 2{,}6 < \bar{x} \leq 3{,}4 \quad (12)$$

Less Feasible :

$$Mi + 1{,}80\ Sdi < \bar{x} \leq Mi - 0{,}6\ Sdi \quad (13)$$

$$= 3 - (1{,}8 \times 0{,}67) < \bar{x} \leq 3 - (0{,}6 \times 0{,}67) \quad (14)$$

$$= 1{,}8 < \bar{x} \leq 2{,}6 \quad (15)$$

Not Feasible :

$$\bar{x} \leq Mi - 1{,}8\ Sdi \quad (16)$$

$$= \bar{x} \leq 3 - (1{,}8 \times 0{,}67) \quad (17)$$

$$= \bar{x} \leq 1{,}8 \quad (18)$$

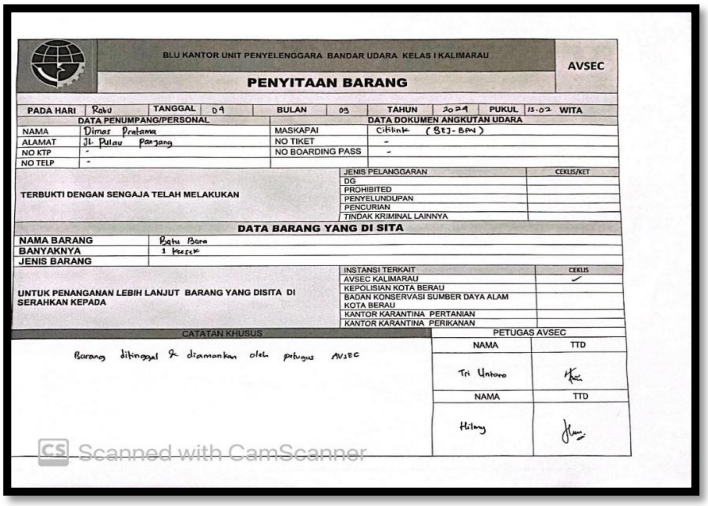
After applying all the categories above, the results can be presented more simply in the following table:

Table 3 Scoring Criteria Conversion Table

Score Interval	Feasibility Category
$\bar{x} > 4{,}2$	Highly Feasible
$3{,}4 < \bar{x} \leq 4{,}2$	Feasible
$2{,}6 < \bar{x} \leq 3{,}4$	Moderately Feasible
$1{,}8 < \bar{x} \leq 2{,}6$	Less Feasible
$\bar{x} \leq 1{,}8$	Not Feasible

RESULT AND DISCUSSION

Planning Phase



BLU KANTOR UNIT PENYELENGGARA BANDAR UDARA KELAS I KALIMARAU

AVSEC

PENYITAAN BARANG

PADA HARI	Rabu	TANGGAL	09	BULAN	05	TAHUN	2024	PUKUL	12.02	WITA

DATA PENUMPANG/PERSONAL			DATA DOKUMEN ANGKUTAN UDARA
NAMA	Dimas Pratama	MASKAPAI	Citilink (QG-864)
ALAMAT	Jl. Pulau Panjang	NO TIKET	-
NO KTP	-	NO BOARDING PASS	-
NO TELP	-		

TERBUKTI DENGAN SENGAJA TELAH MELAKUKAN	JENIS PELANGGARAN	CEKLIS/KET
	DG	
	PROHIBITED	
	PENYELUNDUPAN	
	PENCURIAN	
	TINDAK KRIMINAL LAINNYA	

DATA BARANG YANG DI SITA

NAMA BARANG	Batu Bara
BANYAKNYA	1 Kresek
JENIS BARANG	

UNTUK PENANGANAN LEBIH LANJUT BARANG YANG DISITA DI SERAHKAN KEPADA	INSTANSI TERKAIT	CEKLIS
	AVSEC KALIMARAU	✓
	KEPOLISIAN KOTA BERAU	
	BADAN KONSERVASI SUMBER DAYA ALAM KOTA BERAU	
	KANTOR KARANTINA PERTANIAN	
	KANTOR KARANTINA PERIKANAN	

CATATAN KHUSUS	PETUGAS AVSEC	
Barang ditinggal & diamankan oleh petugas AVSEC	NAMA	TTD
	Tri Untoro	
	NAMA	TTD
	Hilmy	

Figure 3 Confiscated Items Logbook HB-SCP Kalimarau Airport

This phase focused on identifying inefficiencies in the handling of prohibited item reports through direct observation and interviews with AVSEC, CS personnel, and airline staff at Kalimarau Airport. The assessment revealed issues such as reporting delays, fragmented documentation, and weak coordination between relevant units. From this assessment, key system requirements were outlined to shape the application's functionality. The planning outcomes provided a detailed overview of user workflows and operational priorities. As a response to the identified challenges, a tailored digital solution was proposed using the AppSheet platform. The resulting system, known as ASE-R (Airport Security Electronic Reporting), was intended to streamline the reporting mechanism and strengthen collaboration among airport security stakeholders at the HBSCP.

2. Production Phase

System Architecture

Figure 4 Context Diagram – Level 0

The ASE-R application is built upon a low-code AppSheet platform integrated with Google Sheets as its database. The system architecture follows a client-server model, where users interact with the app via mobile or desktop devices, and data is stored and synchronized in real time to cloud-based spreadsheets. Tables are relationally structured, enabling dynamic workflows such as dependent dropdowns, user-specific views, and action-triggered automation. The architecture supports role-based access control, ensuring each unit (AVSEC, airline, CS, and supervisors) only views and inputs relevant data. This modular architecture enhances scalability and ease of maintenance across airports with different operational capacities.

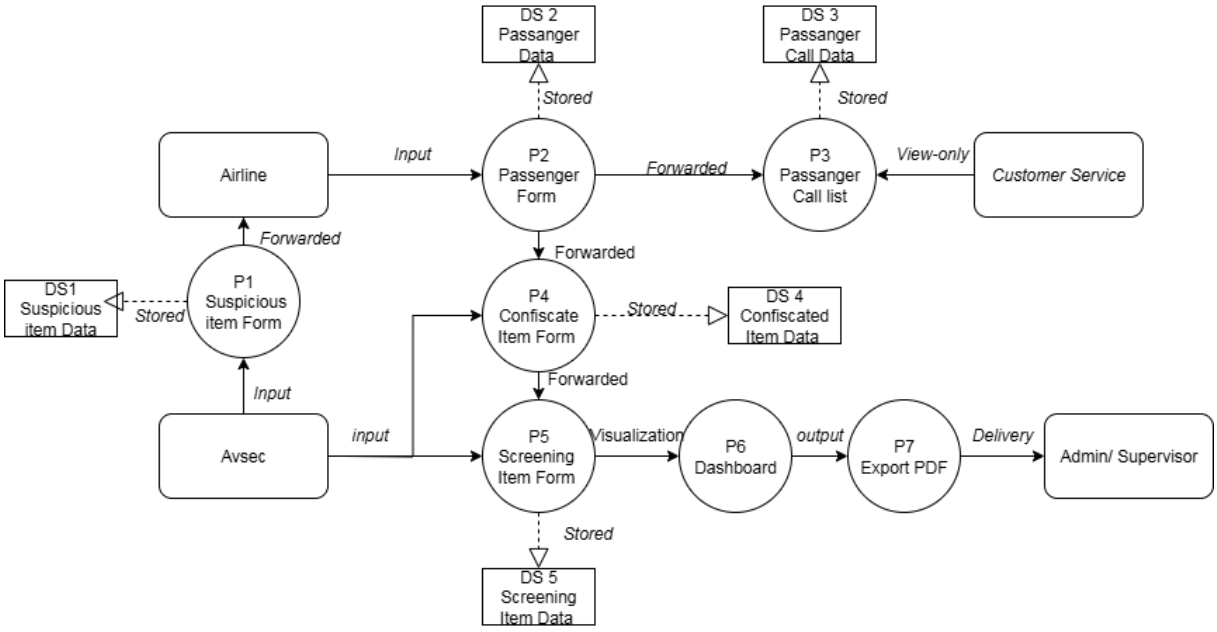


Figure 5 Data Flow Diagram – Level 1 of AppSheet

Application Design

Figure 6 AppSheet Logo

The interface design of the ASE-R application prioritizes usability, responsiveness, and clarity. Key features include structured forms for AVSEC to record suspicious or dangerous items, buttons for airlines to confirm passenger identity, and tabs for CS to mark passenger attendance. The dashboard for supervisors displays weekly and monthly statistics, recent confiscation trends, and follow-up status. Custom branding, icon-based navigation, and conditional formatting help users quickly interpret data and complete tasks. Each form and view is linked to the back-end tables through user roles and slice logic, creating a seamless and guided reporting experience across roles.

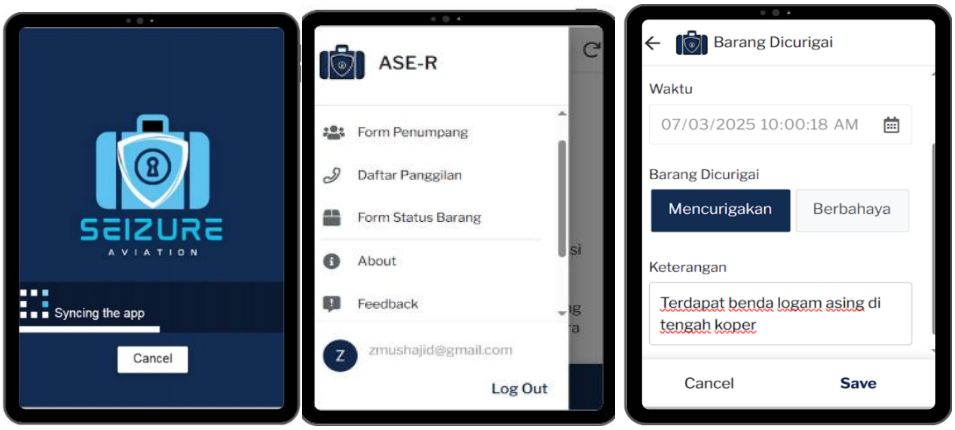


Figure 7 User Interface Design (UI Design)

Application Workflow

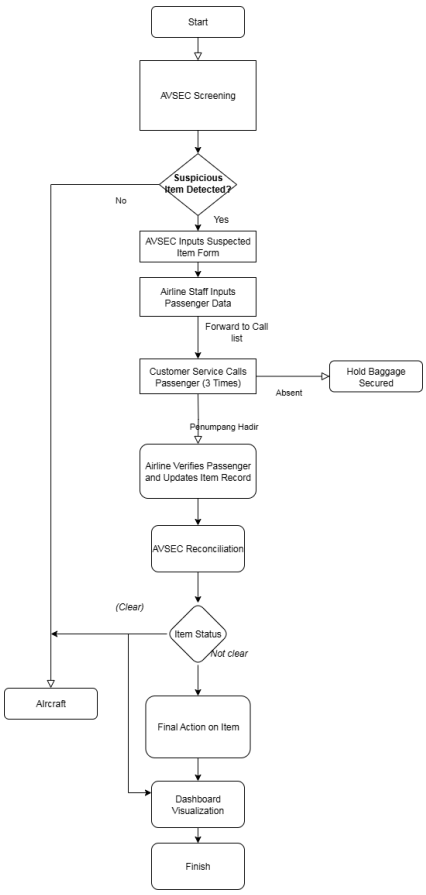


Figure 8 User Flow of AppSheet Application

The application workflow mirrors the HBSCP inspection process. It begins with AVSEC entering data on suspected items, selecting either "suspicious" or "dangerous," which automatically notifies the airline via filtered dashboard. Airlines input the passenger's details into a pre-filled form. CS officers call passengers based on the daily call list and update attendance using a single-tap “Present” button. If items are confiscated, CS inputs them into a seizure log, which is later followed up with a form recording final actions (e.g., disposal, return, report). Weekly and monthly summaries are automatically compiled in PDF reports using AppSheet’s workflow automation.

3. Evaluation Phase

Table 4 Expert Judgement Evaluation

ASPECT	CONTENT EXPERT EVALUATION	ASPECT	IT EXPERT EVALUATION
Content Relevance	5	Content Relevance	5
Language Clarity	5	System Performance	5
Interface Design	5	Interface Design	5
Content Readability	5	Automation & Workflow	5
Total Score	20	Total Score	20

The system was assessed by two domain experts: one specializing in content and one in IT. The content expert rated all four assessment aspect: content relevance, language clarity, interface design, and content readability with a perfect score of 5.0. Similarly, the IT expert also gave a full score of 5.0 for content accuracy, system responsiveness, interface design, and automation & workflow. With a total score of 20 from each expert, the system was classified as "Highly Feasible," indicating excellent alignment with both technical requirements and content quality standards.

Table 5 Usability Testing Results

Usability Aspect	R1	R2	R3	R4	R5	Average Score (1–5)	Feasibility (%)
Ease of Use	5	4	4	5	5	4.6	92%
Task Fit / Feature Relevance	5	5	5	4	4	4.4	88%
Efficiency & Work Speed	5	4	4	5	4	4.4	88%
Visual Design & Navigation	5	5	5	5	5	5.0	100%
Trust in Technology	5	5	5	5	5	5.0	100%
Overall Average						4.68	93.6%

Usability testing involved five users representing different operational units. The evaluation covered five key aspects: ease of use (4.6), feature relevance to task (4.4), efficiency and working speed (4.4), visual design and navigation (5.0), and trust in the technology (5.0). The overall average score was 4.68 out of 5, translating to a feasibility percentage of 93.6%. These results indicate strong user satisfaction, particularly in interface clarity and system reliability, reinforcing the application's effectiveness in supporting daily operations.

Table 6 Reporting Time Comparison Before and After ASE-R Implementation

Process Stage	Paper Based System (minutes)	ASE-R System (minutes)
Suspicious Item Entry	>3	1
Passenger Calling	>6	3
Passenger Data Entry	3	1
Reconciliation & Item Status	5	1
Report Compilation	10	1

The implementation of the ASE-R system has shown significant improvements in the coordination efficiency between AVSEC personnel and airline representatives. By enabling real-time data entry and centralized dashboards, the system reduces reporting delays and ensures that relevant units are promptly informed. This streamlined communication process supports the fulfillment of ICAO Annex 17 and Annex 18 regulations, particularly in maintaining accuracy and traceability in the handling of prohibited items. Furthermore, due to its modular structure and reliance on low-code development, the ASE-R application holds strong potential for replication in other regional airports with limited digital infrastructure.

Although the detailed time standards outlined in Ministerial Regulation PM 178/2015 (e.g., <7 minutes waiting time, 3 minutes for normal inspection, 8 minutes for special conditions) have been revoked and are no longer specified in PM 41/2023, empirical findings from this study demonstrate a significant increase in operational efficiency with the implementation of ASE-R [13]. The digital system effectively reduces processing time across all key stages, reinforcing the practical value of digital

transformation in airport security services even in the absence of explicit regulatory benchmarks for inspection time.

Despite these strengths, the system presents certain limitations. It depends on stable internet connectivity for optimal performance, and currently lacks integration with boarding pass verification systems. Additionally, initial user training is required to ensure smooth adoption across various operational roles. These constraints should be addressed in future iterations to increase system resilience and interoperability.

Practically, the ASE-R application enhances digital oversight and traceability at the checkpoint, thereby reducing redundant entries and minimizing manual errors. Theoretically, this system contributes to the growing body of research on low-code application development in airport operations, offering a replicable model for digital transformation in aviation security. Its role-based design, automated workflows, and operational adaptability serve as a foundation for future innovations in AVSEC digital systems.

CONCLUSION

Based on the research, the development of a confiscated items reporting system at the HB-SCP of BLU UPBU Kalimarau Airport can be optimized through the use of AppSheet, a no-code platform that enables rapid and flexible application development without complex programming. The ASE-R application was designed to replace manual reporting methods with a structured digital solution, incorporating relational database design, intuitive user interfaces, and seamless integration between units such as AVSEC, airlines, and customer service. By combining mobile input forms and a cloud-based database system, the application streamlines passenger and item data entry, records inspection statuses, and logs user activities. Additional features such as QR code scanning, automated workflows (Bots), action buttons, and PDF exports enhance operational efficiency and accountability. The expert validation and usability testing confirmed that ASE-R is highly feasible, with an expert score of 5.0 and a user satisfaction score of 4.68 out of 5, demonstrating its effectiveness in improving data accuracy, reporting speed, and inter-unit coordination.

Given these results, the application has the potential to be adapted and implemented in other airport units with similar reporting workflows, tailored to the organizational structure and data requirements of each location. Further development may include real-time integration with airline boarding pass systems, enhanced item tracking features, and a managerial dashboard based on security metrics to support data-driven decision-making in airport security operations.

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