

A PROPOSAL TO INVESTIGATE THE INEFFICIENT AND UNSAFE CHECK-IN/ BOARDING PROCESS AT ANKARA YHT TRAIN STATION

1.0 INTRODUCTION

More than 4.3 Million passengers use trains per day in Turkey and it is the most used and preferred mode of transport[1]. With such a high amount of passengers choosing trains as their primary mode of transport, it is essential for their travel to be convenient, safe and efficient to eliminate the risk of unnecessary delays, inconveniences, and security risks. Usually, the ticket purchasing process is straightforward and easy and very convenient for travelers. The travel itself is fast and comfortable as well, but with such a convenient ticket booking process and comparable and comfortable travel, it is expected that the check-in/ boarding process would be simple and secure as well.

Ankara YHT Train station has more than 28,000 passengers[5] commuting every day and with such an important station, the checking-in/boarding process needs to be as efficient and comfortable as possible to provide passengers a convenient traveling experience. Because without such a process, there might be delays in passenger check-in, the trains might get delayed and with the risk of a progressive delay happening[11], the whole rail network might suffer. Similarly, in the absence of thorough baggage checking and security clearance for passengers, there is always a major risk of mass-scale tragedies like the Mumbai train bombings in 2006[18]. The security situation is particularly critical in the case of trains as unlike other forms of transport, train passengers always have access to their luggage during travel and availability of any illegal items, like weapons, drugs or in-flammable items, which might result in harsh outcomes for the passengers and severe inconvenience.

The current travel situation involves security checking at the station entrance through a standard baggage scanner and walk-through gate with limited repercussions in case of a metal or illegal item being detected with a passenger. After clearing the security, the passenger moves forward to the boarding counters where passengers queue up outside the Platform entrance and the tickets and passenger details are verified through a semi-automatic process.

This need for an efficient and safe passenger boarding process becomes increasingly relevant in the case of Ankara YHT Train station because the station is a junction for 4 major train lines[4] and is connected to the whole of Turkey. Passengers from all walks of life commute from here and it is necessary that the travel process is streamlined and properly thought-out to avoid any inconvenient situations which might disrupt the rail travel on a bigger level.

In order to make the passenger boarding process more efficient and safe and travel more convenient, this paper will focus on solutions for all the possible issues with the check-in/ boarding process for the passengers. The proposed solutions will be analyzed according to the reliability, efficiency, user-friendliness and cost factors in order to upgrade the current process.

2.0 PROBLEM DEFINITION

In Ankara YHT train station, although there may be multiple areas where the passenger experience and station functionalities may be improved, it is crucial to analyze the check-in and boarding process

first as its relative inefficiency poses a security threat to the passengers and the railway infrastructure and also affects the railway network in general. The major issues with the check-in/boarding process can be identified as the following statements.

2.1 The baggage/ body scanning at entry is insufficient and not sufficiently holistic

The current baggage checking procedure comprises a standard baggage screening through an X-ray scanner[9] at the station entry. The passenger has to pass through a walk-through metal detector and similar to the baggage scanning, the searching is not holistic enough to detect all illegal items. If a scanner detects a metal item with the passenger, the passenger is rarely asked to remove any metals and pass through again. This oversight is relayed in the baggage screening as well, where although everyone is required to pass their baggage through the scanner, the personnel often do not look at the X-ray detection footage and are unable to detect any illegal items in many cases. This situation worsens during rush hours where this human-reliant and limited checking fails to properly clear a high-volume of passengers[6].

Apart from this initial oversight, there is no screening at platform entry points as well and this adds up to the pre-existing security vulnerability of a shallow search at the entrance. Even though a passenger is cleared at entry, there is always a possibility of adding illegal items after entering the station[6]. Such a loophole in security poses a high risk to the passengers traveling through the station and especially on the same train as the passenger carrying illegal items like weapons or drugs. Also, the absence of an additional checking before boarding trains results in increased reliance on the first checking and in case of an oversight, leaves no room for resolve.

2.2 The semi-manual check-in process poses security threats

Station staff use a semi-manual approach to passenger verification during boarding and this human involvement and limited verification poses risk of multiple security threats. The staff uses a hand-held GSM-based ticket verification device[8] to input(by typing) the passenger name from the ticket and verify it against their records. If a reservation is found, the passenger's name is verified against the presented identity document and the traveling passenger is manually verified against the picture on the ID document[4]. With very limited document verification, there is a possibility of someone getting through with a fake ID document. Similarly, there is also a risk of a passenger traveling on someone else's identity documents. Even the ticket validation is errored as with a human manually entering passenger details and manually verifying the passengers against their ID document, there is a big room for error and oversight from the staff. Such cases of an unwanted passenger entering the train illegally may result in harsh outcomes for other passengers and the railway network in general.

With limited accountability and record-keeping of the passenger that traveled on the issued ticket and possibility of fake documentation, it would also be hard to trace any crime back to a face. Such an approach to passenger verification leaves room for unauthorized and in cases, dangerous passengers traveling alongside hundreds of passengers for multiple hours just because there are ways to bypass this verification.

2.3 Human reliance and under-staffed make the check-in process slow

The semi-manual verification process involves the personnel manually typing the passenger's name from the ticket onto a Numpad style keyboard and seeing if the passenger reservation exists. The typing itself increases the time spent per passenger dramatically with an average name-entry time of 13 seconds per passenger[11]. This situation escalates further in cases of misspelled names or errors in typing as the name has to be retyped. Apart from this, the document verification process is

manual as well and the current situation involves the staff verifying the name on the ticket against their records, against the ID provided and the face on ID against the passenger traveling. So, with the staff having to look at four elements (ticket, reservation records, passenger ID document and the traveling passenger) to validate a passenger, the time spent per passenger increases dramatically. Now considering that an average of 348 passengers[2] travel on each train from the Ankara YHT station, the time spent in boarding all passengers increases a lot and this causes unnecessary delays and inconveniences for the passengers.

3.0 PROPOSED SOLUTIONS

To solve the issues identified earlier with the check-in/ boarding process and make the entire system faster, more efficient and secure, three technical solutions have been identified that will help solve the issues and improve the overall travel pipeline at the Ankara YHT train station

3.1 Installation of multiple X-ray scanners/ multi-zone body scanners at platform entry

Alongside the current security infrastructure, Installation of multiple Smart Millimeter Wave X-ray Baggage Scanners (SMWXBS)[16] and multi-zone walkthrough metal detectors (MWMD)[12] at the platform entry points will increase the overall security detail and eliminate multiple security risks. SMWXBS specializes in automatically identifying and pointing out banned items in luggage bags using AI detection algorithms (with upto an accuracy of 93%)[6]. In case of an illegal item getting detected, there should be a separate section for baggage assessment by the security personnel so that the current passenger queue is not disturbed and delays are reduced. This would help make the baggage screening more detailed and less-reliant on human vision and perception and hence, more accurate. Similarly, the installation of an MWMD alongside the SMWXBS would increase the security insight for the passenger as well and help make the checking faster. MWMD identifies where exactly is the metal on the passenger's body and eliminates the time wasted by the security personnel in searching for metals throughout the passenger's body and passenger having to go through the walk-through door multiple times. MWMD is also more accurate in metal identification than traditional walk-through gates and hence, is expected to have better performance in detecting illegal items. So, with such a holistic and thorough checking, the chances of a passenger carrying an illegal and dangerous item would be significantly reduced[7]. But since human involvement decreases and the proposed tools identify illegal items faster, the overall efficiency of the security clearance process would increase as well.

3.2 Use of Automatic document scanners and FR recognition cameras for security clearance of traveling passengers.

Installation of a centralized, cloud-backed, document verification system that utilizes optical mark recognition (OMR) to verify passports/ ID cards and ticket reservations[15] will ensure that the items presented are legitimate and make the verification faster. The staff will just have to scan the QR codes given on the travel documents and the software will run it through the cloud-based databases to see if the documents are legit. Apart from this, Facial Recognition (FR) cameras[] should also be installed that utilize Artificially intelligent(AI) algorithms to accurately identify the traveling passenger against the documents provided by them[14]. This approach reduces the overall reliance on the staff and makes the passenger clearance process more accurate. Also, since the human processing time and verification/ typing delays are eliminated, the overall process becomes faster and more efficient as well.

3.3 Installing automatic check-in kiosks across the station

To further reduce the load on check-in/ boarding counters and make the boarding process faster and more convenient for some passengers, automatic self-check-in kiosks should be installed across the station. The kiosks would include a QR code scanner, an FR camera, a touch screen alongside a similar software as the staff at the check-in counter[14]. Through proper step-wise instructions, the passenger will be able to scan their tickets, ID documents and scan their face to automate the check-in and verification process and eliminate the time this passenger would spend at the check-in counter going through the same process. In case if all documents are verified, the passenger will be issued a boarding card which will have a QR code that can be scanned at platform entry points to proceed directly to the baggage/ body checking queues. This approach would reduce the load on check-in/ boarding counters[13] and increase the overall efficiency of the system and make the situation more convenient for the traveling passengers.

4.0 CRITERIA FOR ASSESSING THE PROPOSED SOLUTIONS

To assess the validity and effectiveness of each provided solution, each solution will be assessed against the following criterion.

4.1 Reliability

SMWXBS: reliability of the upgraded baggage scanners in detecting illegal items properly and increasing the security detail of the system.

MWMD: reliability of the proposed walkthrough metal detectors in detecting metal items properly and exactly identifying their location to avoid unnecessary checking[12]. Also, they should reliably increase the security detail of the system.

Software: reliability of the document/ passenger verification software in properly verifying the documents, tickets, and passenger facial details. Since this will be a cloud-based system, another important factor would be seeing the reliability of the software in erroneous cases like limited internet access and concurrent client requests that require excessive server resources.

4.2 Efficiency

Security checkpoint: Efficiency of the proposed security checkpoints (with SMWXBS and MWMD) will be assessed in improving the overall time spent per each passenger in checking to see how efficient the process is.

Check-in Kiosks: Efficiency of the automatic check-in kiosks will be assessed to identify if their positioning is accurate and if their presence is actually having an effect on the passenger queue sizes at the check-in counters and if they are making the check-in procedure faster and more accurate for the passengers.

Software: The software, used by the check-in counter staff and the automatic check-in kiosks, will be assessed to see it's average passenger processing times and to see if it is more efficient and faster than the existing manual verification system.

4.3 Cost

The cost of acquiring, maintaining and operating the SMWXBS, MWMD, and check-in kiosks will be considered in assessing the solutions. Also, the cost of development, operation, and maintenance of the cloud-based software infrastructure will be taken into account.

5.0 PROPOSED RESEARCH METHODOLOGY

5.1 Literature review

Secondary sources like newspaper articles, research papers, user manuals will be used to learn about the standard procedures and regulations of implementing such systems, learn about similar implementations and utilize that to improve the approach and verifying the expected outcomes against similar existing infrastructures.

5.2 Market research

Market research will be done for equipment installation costs and software infrastructure development/ maintenance costs and to analyze their cost against their effectiveness.

5.4 Field observation

A thorough in-field observation will be conducted of the Ankara YHT train station to analyze possible positioning and placement of the relevant equipment across the station and to estimate the outcomes of various strategies.

5.3 User surveys

Passengers/ Station staff will be surveyed to list down possible use cases and list down relevant details to be implemented in the system. Also, such surveys would help in assuming the users' perspective of the solutions and get their insight into the validity of the problems.

REFERENCES

- [1] TCDD, “Passenger capacity increases in Ankara?: DW: 12.10.2019,” raillynews.com. [Online]. Available: <https://www.raillynews.com/2018/10/50-increased-passenger-capacity-2/>. [Accessed: 13-Mar-2020].
- [2] “TCDD reports on high-speed train operations: DW: 19.02.2010,” uic.org. [Online]. Available: <https://uic.org/com/uic-e-news/173/article/tcdd-reports-on-high-speed-train>. [Accessed: 13-Mar-2020].
- [3] “Evaluating the Relation Between Station Area Design Parameters and Transit Usage for Urban Rail Systems in Ankara, Turkey” DW: 10.03.2020,” springer.com. [Online]. Available: <https://link.springer.com/article/10.1007%2Fs40999-020-00506-7>. [Accessed: 13-Mar-2020].
- [4] “COMPARISON OF HSR LINES IN TURKEY AND THE WORLD AND THEIR SPATIAL IMPACT: A CASE STUDY OF THE ANKARA–KONYA HSR LINE” DW: 12.02.2019,” witpress.com. [Online]. Available: <https://www.witpress.com/Secure/elibrary/papers/UT17/UT17047FU1.pdf>. [Accessed: 13-Mar-2020].
- [5] HAFİF RAYLI SİSTEMLER HABERLERİ, “Ankara’da günde 400 bin kişi raylı sistemleri kullanıyor” DW: 12.10.2019,” raillynews.com. [Online]. Available: <https://www.trenhaber.com/hafif-rayli-sistemler/ankara-da-gunde-400-bin-kisi-rayli-sistemleri-kullaniyor-h1390.html> [Accessed: 13-Mar-2020].
- [6] “Automation in airport security X-ray screening of cabin baggage: Examining benefits and possible implementations of automated explosives detection” DW: 12.01.2019,” sciencedirect.com. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S000368701830108X>. [Accessed: 13-Mar-2020].
- [7] “Walk-Through Metal Detectors for Use in Concealed Weapon and Contraband Detection” DW: 10.03.2019,” ncjrs.gov. [Online]. Available: <https://www.ncjrs.gov/pdffiles1/nij/193510.pdf>. [Accessed: 13-Mar-2020].
- [8] “Hand-Held Electronic Ticket Verification Devices” DW: 12.01.2017,” mpdc.dc.gov. [Online]. Available: <https://mpdc.dc.gov/page/hand-held-electronic-ticket-issuance-devices> [Accessed: 13-Mar-2020].
- [9] “Hold Baggage Security X-Ray Machines” DW: 12.01.2015,” scanxsecurity.com. [Online]. Available: <http://www.scanxsecurity.com/hold-baggage-x-ray-machines/> [Accessed: 13-Mar-2020].
- [10] “Multi Zone Metal Detector Body Scanner / Walk-Through Metal Detector Gate” DW: 12.01.2019,” securitybaggagescanner.com. [Online]. Available: <http://www.securitybaggagescanner.com/sale-10652252-multi-zone-metal-detector-body-scanner-walk-through-metal-detector-gate.html>. [Accessed: 13-Mar-2020].

- [11] "Ticket queuing times at major rail stations" DW: 12.01.2012," passengerfocus. [Online]. Available: <https://www.transportfocus.org.uk/research-publications/publications/ticket-queuing-times-at-major-rail-stations/>. [Accessed: 13-Mar-2020].

- [12] "Multi Zone Metal Detector Body Scanner / Walk-Through Metal Detector Gate" DW: 12.01.2019," securitybaggagescanner.com. [Online]. Available: <http://www.securitybaggagescanner.com/sale-10652252-multi-zone-metal-detector-body-scanner-walk-through-metal-detector-gate.html>. [Accessed: 13-Mar-2020].

- [13] "Breezing through airport security" DW: 12.09.2012," straitstimes. [Online]. Available: <https://www.straitstimes.com/singapore/breezing-through-airport-security>. [Accessed: 13-Mar-2020].

- [14] "Airline self-service check-in kiosks mean more time for airport shopping" DW: 12.12.2017," traveller.com. [Online]. Available: <https://www.traveller.com.au/airline-selfservice-checkin-kiosks-mean-more-time-for-airport-shopping-11tbj9>[Accessed: 13-Mar-2020].

- [15] "Innovative OCR-VCS scanning solution reduces number of unidentifiable luggage items" DW: 12.10.2017," passengerterminaltoday.com. [Online]. Available: <https://www.passengerterminaltoday.com/news/baggage/innovative-ocr-vcs-scanning-solution-reduces-number-of-unidentifiable-luggage-items.html>. [Accessed: 13-Mar-2020].

- [16] "How Millimeter Wave Scanners Work" DW: 19.03.2020," howstuffworks.com. [Online]. Available: <https://science.howstuffworks.com/millimeter-wave-scanner1.htm> [Accessed: 19-Mar-2020].

- [17] "Mumbai train bombings," wikipedia. [Online]. Available: https://en.wikipedia.org/wiki/2006_Mumbai_train_bombings [Accessed: 19-Mar-2020].