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Airport Common-Use Check-in Operations: A Novel and Efficient Model

Alper DALKIRAN

Highlights:

- Unpleasant passenger experience modeled under emotions, experience, severity measure, and consequences
- The field personal utilization value had dropped from 90% to 0% per the availability.
- extra working hours and hiring are unnecessary in high season

Keywords:

- Aviation Passenger services
- Airport IT Service
- Airport Management
- ITSM
- Service Management
- IT Service Design

ABSTRACT:

This paper examines the capacity problems of common-use environment service improvement and airport passenger services in line with information technology (IT) issues. There are many time-critical processes in the airport terminal for the necessary airport passenger flow processes that IT service design aims to support it. Many flow processes can be designed under several functions while international, domestic, or general aviation cases. The current approaches have been based on the standard industrial methods based on the Information Technology Infrastructure Library (ITIL) practices. However, this infrastructure library practices' distinct general industrial foundations and airport time-critical processes could not fit customer expectations. *This research offers an approach by adding a pre-layer with a user certification rather than fixing the problems on the ground.* Although the proposed novel model does not conflict with the ITIL practices, it primarily develops the practices by coinciding with them a certificated training of end users to establish a positive passenger experience and helping the profitability of the airport. The offered model simulation results show that the Airport IT Service helpdesk and field team instantaneous utilization average was reduced from 96% to 28%, and the field team queue duration during the airport peak hours was 26 minutes to 2 minutes. This study demonstrates that the airport IT support service design should be re-considered during its passenger service operation.

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INTRODUCTION

The availability of check-in desks limits the operating effectiveness of the airport. In practical terms, more availability can assist in the more effective use of a limited number of airport check-in counters by the airport authority. Additionally, it can assist in the more efficient allocation of support teams, which can help passengers and airlines more effectively use personnel. Of the need for commercial income, neither airports nor passengers want to wait in queues of check-in counters. The airport check-in process should be planned effectively and efficiently (Yavuz et al., 2020). A study shows that the claimant passenger rate is 59% because of check-in services (Molina Cecchetti, 2004). A novel method is proposed to define a solution to assess operational effectiveness in airport resource allocations by the mean disregarded problem of check-in agents' clumsiness relations with IT types of equipment.

When viewed through service engineering, the Information Technology (IT) service industry is undergoing a fast transition, especially in the aviation services sector. Many firms have sought, but failed, to build their IT services (ITS) in compliance with various certifications to generate new business models to serve their customers better. In many instances, customers have not placed a high value on the suggested service models because no more importance is being provided to the existing supplier-client partnership (Steinberg, 2014).

The higher the number of business needs generated by the passenger, and indirectly by the business itself, the higher it rises, and the more remarkable customers demand service recovery time. In the airport ITSM market, many companies are implementing ITIL-based ITSM processes for these environments. However, because there are insufficient references, they must learn by trial and error. During this time, service providers began implementing a set of procedures known as the IT alignment planning process. It is feasible that the IT alignment planning process will take up to four years to complete. The initial phase of the IT alignment planning process should consist of pilot implementation, followed by an enterprise-wide deployment (Peak and Guynes, 2003). IT alignment planning acquired the attention and acceptance of all company divisions due to its adaptive design and easy integration with corporate strategic planning methods.

On the other hand, higher levels of IT management have understood the IT alignment as below items as per research among the 300 CEOs and CIOs (Luftman, 2003):

- Alignment between IT and the business,
- Strategic planning for IT,
- Security and privacy,
- Recruiting, training, and keeping IT workers,
- Figuring out the value of IT investments;
- Figuring out how well the IT department is doing;
- Quickness and agility,
- Making an information architecture,
- Making things less complicated,
- Reengineering business processes.

Product measures pertain to software objects, whereas process measures pertain to software creation, testing, and maintenance. The IEEE Standard Dictionary of Measures to Produce Reliable Software (IEEE, 1989) describes this simple classification of metrics as either process or product metrics. In the field of IT service management, information technology service providers have a variety of measuring targets from which to choose. They can measure the performance of any IT service management process, the maturity of IT service management processes or an IT organization, customer satisfaction with IT services and processes, such as costs of service or service unavailability, which are business performance as the quality of IT service. The Capability Maturity Model Integration (CMMI) for services (Lahtela et al., 2010; Ninssinka et al., 2005) and other maturity assessment models (ITSMF UK, 2007) can be utilized to assess the maturity level of an IT organization’s ITSM procedures. It stands to reason that various methods of measuring will need to be utilized depending on the aim of the investigation.

There is not much literature found directly on the Common-Use IT services in airports. However, research related to check-in services has been grouped under Check-in, Customer satisfaction, Optimization, Performance evaluation, and service-related subjects. The frequency table analysis can be seen in two sub-groups noticed in the literature for check-in; services were written in Departure Control Systems (Adamcik et al., 2018), and the advantages of shared staff were highlighted by Alodhaibi et al. (2020). Two studies are listed in Customer satisfaction analysis and auditing by AlKheder (2021) and Attié (2021), respectively. Optimization subjects can be grouped under Algorithm Development, Behaviour Analysis, Capacity, Modelling, and Simulation. Ornek et al. (2019) have developed an algorithm to resolve counter-assignment problems. Optimization using behavioral analysis is the second most popular sub-category in the optimization subjects, have been studied by Yang and Zheng (2021), Adacher and Flamini (2021), and Moon and Lee (2022). The most popular sub-category is modeling, which is supported by Orhan and Orhan (2020), who has studied passenger flow modeling, Zhou et al. (2018) developed a dynamic model for queuing problems; Jencova et al. focused on parallel check-in allocation models, and Ueda and Kurahashi (2018) explored the best operational models of self-service technological models. Two recent studies show themself while searching for capacity sub-group as gate assignment problem (L’Ortye et al., 2021) and terminal building capacity evaluation (Alnowibet et al., 2022). Additionally, Alodhaibi et al. (2019) worked on passenger outbound processes, and Brause et al. (2020) studied passenger service optimization in blackout situations as simulated computer resolutions.

Table 1: A frequency analysis of recent studies on Airport Check-in Services

Research Subject	Modifier	2018	2019	2020	2021	2022	2023	Total
Check-in	Service	1						1
	Shared Staff			1				1
Customer satisfaction	Analysis				1			1
	Auditing				1			1
Optimization	Algorithm Development		1					1
	Behaviour Analysis				2	1		3
	Capacity				1	1		2
	Modeling	2		1			1	4
	Simulation		1	1				2
Service	Improvement	4	2	1	1	2		10
	Quality		1			2		3
	Total	7	5	4	6	6	1	29

The most popular subject is Service Improvement in recent studies. There are ten papers found in the literature related to this subject. The three studies focused on technological advancements and digital transformation (Kaushik and Thakur, 2022; Zaharia and Pietreanu, 2018; Kovynyov and Mikut, 2019); six papers, on the other hand, assessed the problems on process evaluation and problem management (Park and Lee, 2020; Ahmed, 2018; Zhou et al., 2022; Gures et al., 2018; Choi, 2021; Andreassen et al., 2018). Suroso and Nasution (2019) completed an analysis of self-check-in counters cognitive work.

The frequency analysis mentioned above was the recent publications on airport check-in services. However, a small group of academicians studied IT service subjects. Jantti has stated that the service desk software does not provide a methodical way of recording ideas for making improvements (Jäntti, 2012a). If "Improvement ideas" are brought to the attention of a Continual Service Improvement team or a Change Management team, there is a chance that a breakthrough may materialize. Still, it is not enough to set forth a significant improvement in the IT support area. Also, Jantti et al. have summarized the IT service desk improvement process in four steps (Jäntti, 2012b). The first step, the difficulties associated with providing help to customers, are discussed. The second step of this article revealed that they have discussed how these problems were resolved by utilizing ITIL-based procedures. In the third step, they demonstrate how the service desk's performance and ITSM training's value were evaluated. This step partially matched the solution offered in this article. The takeaways and lessons from the case are discussed in the conclusion step.

For IT service management, there are a variety of standards and frameworks. Each of these standards and frameworks addresses the need to monitor and assess service management and offers its metrics. The Control Objectives for Information and related Technology (COBIT) framework (COBIT, 2019, p. 17) was designed to guide IT governance by arranging advice on processes, organizational structures, information flows, people's skills and competencies, principles, policies and procedures and also, services, infrastructures, and applications. For each delivery and support process, including DS8 Manage Service Desk and Incidents and Manage Problems, COBIT provides both process metrics and maturity level metrics. These measures can assess a company's delivery and support capabilities. The first-line resolution rate, the proportion of reopened events, the proportion of problems that were recorded and monitored, and the proportion of problems that recurred are examples of metrics (within a certain amount of time). The two components of the auditable standard for IT service management known as ISO 20000 are the specification for service management (ISOIEC20000, 2005a) and the code of practice for service management (ISOIEC20000, 2005b).

This standard conforms to ITIL and is auditable. The organization must develop suitable monitoring and measurement techniques for service management operations as one of its conditions. This measurement requirement is among the requirements, and it seems impossible to reach the desired ability level without using the standards. In addition, ISO 20000 requires businesses to deliver reactive, proactive and planned reports that reflect their IT service management operations. ISO 20000, on the other hand, does not stipulate which metrics must be used to measure the processes. Jantti has highlighted the significance of adhering to the standards by describing the phases of implementing an IT support organization. These phases focused on improving the service desk and incident management process from the viewpoint of IT service management by providing lessons learned from any study. Jäntti (2012b) has described the phases and provided lessons learned from the study. The results of this approach have been published in another study of Finnish Tax Service IT Service Management (Jäntti et al., 2012).

Airports are, on the other hand, multi-cultural entities. IT service design efforts must be considered under technology acceptance and aligned with different customer values. Local or international approaches can be accepted in the subject airport IT service environment (Steinberg, 2014). ITIL has become a de facto standard for IT Service Management in recent years since it is increasingly used to describe and deliver IT services. On the other hand, ITIL is a common practice approach without an explicit process definition, which allows for a great deal of flexibility. This article discusses the progression to a reference model for IT Service Management procedures and demonstrates their incorporation into a comprehensive process framework for IT management (Rohloff, 2008).

Lahtela et al. (2010) have developed an ITIL-based IT service management measurement system to measure the system's performance on the managers. The authors studied the performance on 18 parameters and focused on the base parameters as open, closed, and new incidents to find the maximum and minimum limits for desired performance. However, this solution can be effective if the incident calls are limited and distributed in time or the customer distinguishes no time-critical special requirements. Besides, the authors have resolved their limitations in the one-unit case.

This paper focuses on redesigning the process by adding simplified training and certification to find possible solutions by building a structure for simple airport IT Service data. Offered certification will enable check-in agents to understand the common-use peripherals readiness, which was the leading root cause of the problem. The data shown in the basics are used to analyze a simplified approach to the problem. Redesigning a business process should create unseen problems in the system. Merely this productivity and functionality are the most significant aspects while designing the IT service to create efficient operations, which needs to be implemented to resolve the trailing problems. Beyond that, the integrity of effective service with the other pieces of IT service must be thought from scratch.

MATERIALS AND METHODS

IT service in airports has several configuration items (CIs) as the customer differentiates with the requirements in both the service level agreement (SLA) and the configuration management (CM) in line with the incident management (IM). Airport services in this study are limited by the common-use equipment that is the undetermined customers in the front end. Tang (2009) has highlighted the significance of check-in counter assignments in resource efficiency in actual airport operation usage. Therefore, practical counter desk usage directly relates to check-in counter availability. Also, walking distance to gates, wait time, and check-in line length can be minimized, enhancing airport service or system performance. These measurements reflect service or system performance and assign flights to check-in counters (Yan et al., 2003).

Nevertheless, airports often have two types of check-in counters. Common-use and airline-specific techniques have been used in different portions of airport configurations. Growing flights and limited check-in desks pushed airports to employ shared counters. Yan et al. (2005) have offered a solution to solve the problem of common-use assignments efficiently. They have decomposed the problem into two more minor issues and solved them repeatedly to achieve a near-optimal solution. Simulations revealed widespread check-in reduces average wait times and helps 'counter and personnel' planning. (Bevilacqua and Ciarapica, 2010). Wu and Mengersen (2012) have conducted an airport operations system performance review to guide future works.

Joustra and Dijk (2001) studied check-in queues to determine their effectiveness and found the following to be true:

- Provide operational check-in rules insights through quantitative foundation and animation.
- Study check-in facility capability.
- Evaluate operational check-in planning.
- Improve check-in staffing.

Appelt et al. (2007) employ a similar modeling strategy for check-in as prior research (Joustra and Dijk, 2001). Proposed check-in modeling scenarios include the analysis of online check-in usage, capacity studies, resource allocation, and visualization of probable future circumstances. Another research predicted airport check-in capacity using fuzzy logic rules based on passenger sum and the number of bags (Kıyıldı and Karasahin, 2008). However, all the above studies disregarded another primary problem that can be called check-in agents' clumsiness with IT equipment.

This undercover problem is another significant gap in check-in assignment efficiency. Any check-in agent could not manage a basic paper jam problem or missing to deal with any software interaction like clearing the print queue, made the assigned desk occupied for the next 15 to 30 minutes related IT Service support technician to intervene in the problem.

Set up a Simulation Model as a Solution

Predicting the continual changes that occur at airports is greatly aided by simulation. Experience has a crucial role in determining how each passenger behaves. Their behavior is consequently difficult to anticipate. Simulation enables the modeling of various passenger behaviors, considering staffing schedules and variations in passenger volumes based on the time of day or weekday. As to resolve a problem as complex as it could be can be resolved by the simulation. The nature of the problem can be seen in Figure 1.

This known process schema describes an ITIL best practice approach to common-use platforms of airports. An incident call to the Airport IT service desk triggered this known process. Check-in agent logs in when a counter is dedicated to the ground handling company or airline on the airport resource management system. Check-in agent logs in when a counter is dedicated to the ground handling company or airline on the airport resource management system. Check-in agent has started their user interface (UI), which can be a graphical user interface (GUI) or any command prompt based on the airline departure control systems architecture. This UI can be a web-based application too. The Check-in agent should sign on and ensure the readiness of peripherals that can measure the bag weight and scans the passports, IDs, and printers to print baggage tags and boarding passes. Some systems still need to clear the printer queue before the check-in operations. Also, printers may need attention while loading the paper stock to the printers. Many problems can be caused by missing this step.

Airport IT support has dedicated three levels of support.

- 1st level is helpdesk support, which is responsible for categorizing the incidents, exploring the opportunities for remote resolution, transferring the incident to higher level intervention, or carrying the incident to closure.
- 2nd level is the field team support for asked help for the current incident. Field teams are generally divided into junior and senior technician sections categorized by their experiences.
- 3rd level is when the developer team points out the software designer who does the automated tasks instead of agents.

This study focused on resolving the inefficiency problems between agents and check-in stations due to the nature of Airport IT support of common-use platform design. The current airport common-use design provides a platform for all airlines to work on the same device set. Thus, all airlines and check-in agents do not have to change all hardware sets and connection settings throughout their dedicated time. Since time is a valuable asset, this study offers a training schema provided in Figure 2. Also, airport management does not charge extra investment payback or operational costs for more extensive check-in areas and resources. There will be unpleasant consequences of inefficient computer and peripheral use on airport management, handling agents, airlines, and passengers. Table 2 summarizes those results in four domains: emotions, experiences, severity measure of the influence with adverse effects, and consequences of contributed factors. The observations and discussions after the industrial professionals have prepared this table. The conversations and observations were reported to the airport IT management as an improvement point. Those improvement points were neither answered nor evaluated.

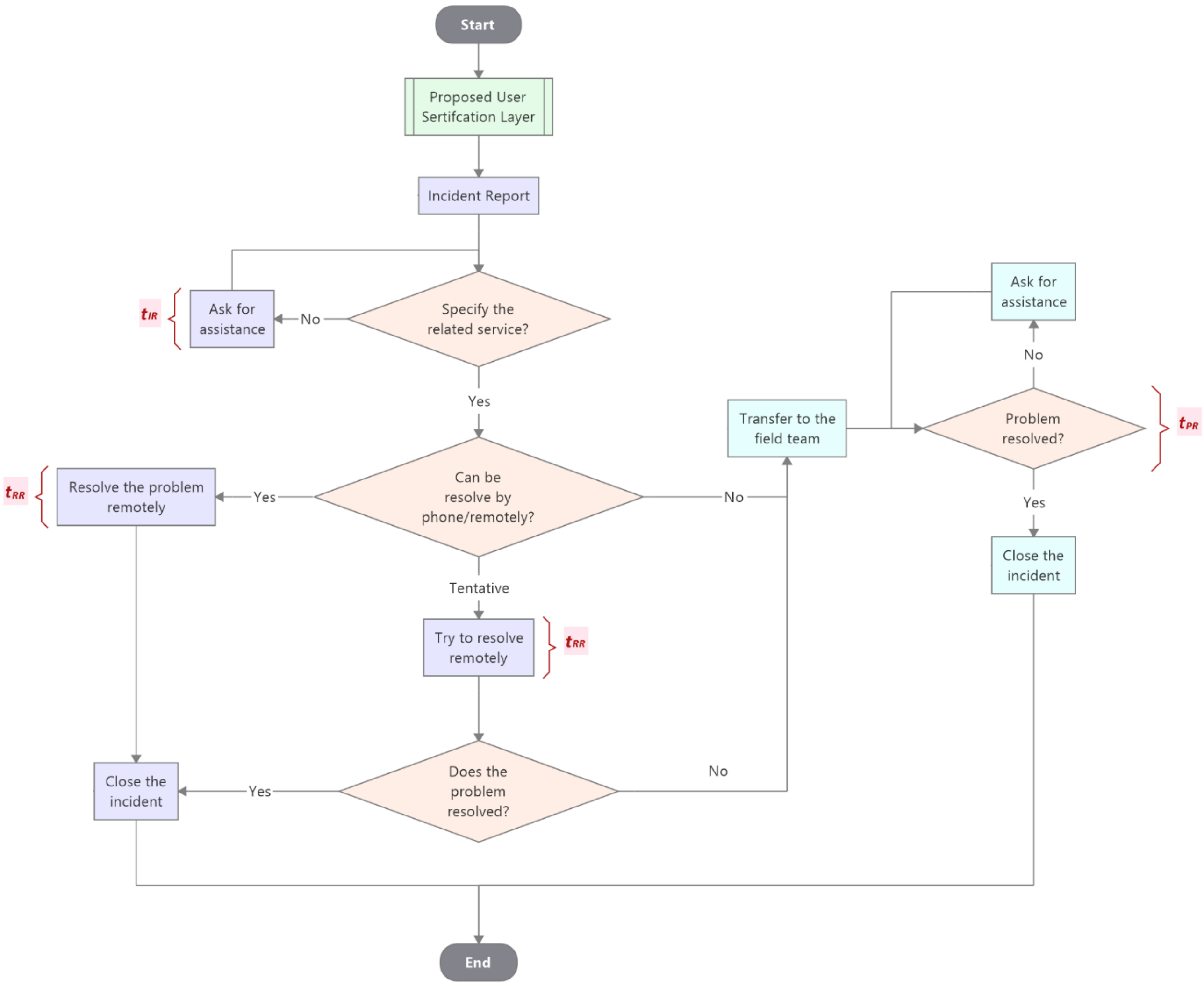


Figure 1. Process schema of a known IT Support Process for airports Common-Use check-in desks *including proposed layer*

Airport IT Service design aims to reduce the unwanted time to fix the problem remotely and intervene on-site. The duration presents the remote intervention time spent to fix the problem remotely. Additionally, it defines the duration for categorizing an incident before the corrective actions of the reported incident. The duration addresses the field problem resolution. The below equations calculate the average duration of the helpdesk intervention $\bar{t}_{HD}$, which can be calculated by Equation (1). The 1st level average duration is $\bar{t}_{1st}$, and the 2nd level average duration is $\bar{t}_{2nd}$. The $t_{IR,i}$ value represents the duration of the intervention request of each measurement. Equation (2) and Equation (3), respectively, lets the values be calculated in a defined timeframe. The t_{RR} measurement demonstrates the duration of the remote resolution, adding each attempt as a sum by the different resolution teams. Moreover, lastly, t_{PR} points out the duration of problem resolutions for 2nd level resolutions.

$$\bar{t}_{HD} = \frac{\sum t_{IR,i}}{n} \quad (1)$$

$$\bar{t}_{1st} = \frac{\sum t_{RR,i}}{n} \quad (2)$$

$$\bar{t}_{2nd} = \frac{\sum t_{PR,i}}{n} \quad (3)$$

Table 2. Unpleasant results of inefficient counter-allocation time

	Emotions	Experience	Severity Measure	Consequences
Airport management	Inability	Resource management issues in peak hours	Prolonged durations effect on planning changes	Increasing check-in fees
Handling Agent	Stress, Helplessness	Organizational poorness, capacity increases	Changing shift planning and unplanned overtime	Increasing staff count
Airline	Insufficiency	Connection times mismatch and uncontrollable organization	Affected fillet planning and crew management	Alternative locations or handling agents
Passenger	Anxiety, Tension	Difficulties reaching food, beverage, or other amenities or lacking communication with their relatives.	Number of unhappy passengers for the affected flight	Unwillingness to buy new tickets

Table 3 defines the relations of resolution groups of incidents. On the other hand, Table 4 describes the model's duration calculations hierarchy and approach. Both tables explain the approach in four stages. The four stages of received incidents have been grouped under incident opening, incident updating, remote resolution, and field resolution items. However, resolving under the incident update time and which level is responsible at this stage is impossible. Therefore, this stage was removed from the approach.

The data must be normalized since it has been gathered from the yearly incident reports. The data recording system was not designed to measure direct team performances that need to be altered and normalized by specific approaches. The resolution codes have filtered the data, and office IT support incidents have been disregarded. Therefore, the other resolution codes like airside support works, car park incidents, and flight information system calls have been filtered from the results. This purification took lots of time, but finding a good result and proving the model was working was necessary.

On the other hand, reports were not specific enough for ongoing incidents' month closure. It is intensely used to measure support teams' key performance indicators. This study accepts that the next month's first two days resolved those results, and those become irrelevant in this study. However, those figures are shown in the results section.

The check-in operation options can be summarized below. The traditional Check-in Model is the most common check-in model, where passengers physically check in at the airport counter and drop off their luggage. Self-Service Check-in Model allows passengers who use self-check-in automated kiosks or machines provided by the airlines. Online Check-in Model enables passengers to check in for their flights online, usually 24 hours before departure, and print their boarding passes at home or the airport. Mobile Check-in Model has let passengers act freely. Like online check-in, passengers can check in for their flights using their mobile devices and receive a digital boarding pass. Curbside Check-in Model is a model that allows passengers to check in at the airport curb, usually with the assistance of airline staff who come to the passenger's vehicle. Remote Check-in Model lets passengers check in at remote locations such as hotels or conference centers before going to the airport, usually with the assistance of airline staff. The automated Baggage Drop Model is a model that allows passengers who have already checked in to drop off their luggage using automated machines provided by the airlines. Home Baggage Check-in Model is the newest model that enables passengers to have their luggage picked up from their home or hotel and checked in for their flight, usually for an additional fee.

This paper focuses on the first two operational check-in options. However, these two still the most common approach for check-in services. The IT support models for the check-in, as mentioned earlier options, can be listed below:

- In-house IT Support Model: In this model, the airline or airport has its own IT support team responsible for maintaining and supporting check-in desk IT systems.Outsourced IT Support Model: In this model, the airline or airport outsources its IT support to a third-party provider responsible for maintaining and supporting the check-in desk IT systems.
- Hybrid IT Support Model: In this model, the airline or airport has a combination of in-house and outsourced IT support. For example, the airline may have its own IT support team but also use a third-party provider for specialized IT support services.
- Cloud-based IT Support Model: In this model, the check-in desk IT systems are hosted on cloud servers, and the airline or airport relies on the cloud provider for IT support and maintenance.
- Managed IT Support Model: In this model, the airline or airport contracts with a third-party provider for comprehensive IT support, including monitoring, maintenance, upgrades, and troubleshooting.
- On-demand IT Support Model: In this model, the airline or airport contracts with a third-party provider for IT support as needed. For example, the airline may call on the provider for support during peak travel seasons or special events.

These models may also involve different IT support services, such as hardware maintenance, software updates, network and security support, and helpdesk support. Table 2 describes those sections grouped under Help Desk Level, 1st Level, and 2nd Level operational teams. Each level has done troubleshooting steps, but the level of the problem limits their tasks.

Table 3. The relations of resolution groups

	Roles on IT Support		
	Help Desk Level	**1st Level**	**2nd Level**
Incident opening	TRUE	FALSE	FALSE
Incident updating	TRUE		
Remote Resolution	TRUE		
Field Resolution	FALSE	TRUE	

Table 4. Calculation hierarchy of average duration distribution for each group

	Calculation of Average Durations on IT Support		
	Help Desk Level	**1st Level**	**2nd Level**
Incident opening	$\bar{t}_{HD}$	0	0
Incident updating	N/A	N/A	N/A
Remote Resolution	$\bar{t}_{1st}$	$\bar{t}_{1st}$	$\bar{t}_{1st}$
Field Resolution	0	$\bar{t}_{2nd}$	$\bar{t}_{2nd}$

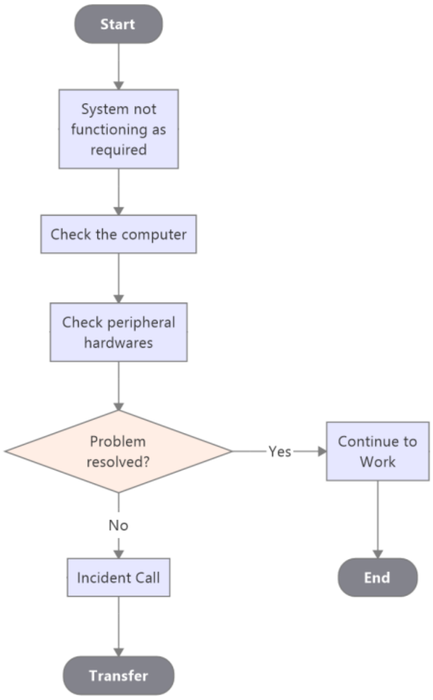


Figure 2. Proposed model for training and certification that lets check-in agents to do preliminary checks

Figure 3 has been developed to be a base for simulation studies. This horizontal concept map can be assessed as a time flow starting with an incident to showing disposal points in green termination points. Average durations and the resolution level data helped develop this flow model. Simulation software has been programmed by the details shown in the pink rectangular. Those data have been filtered through an analysis to support this simulation.

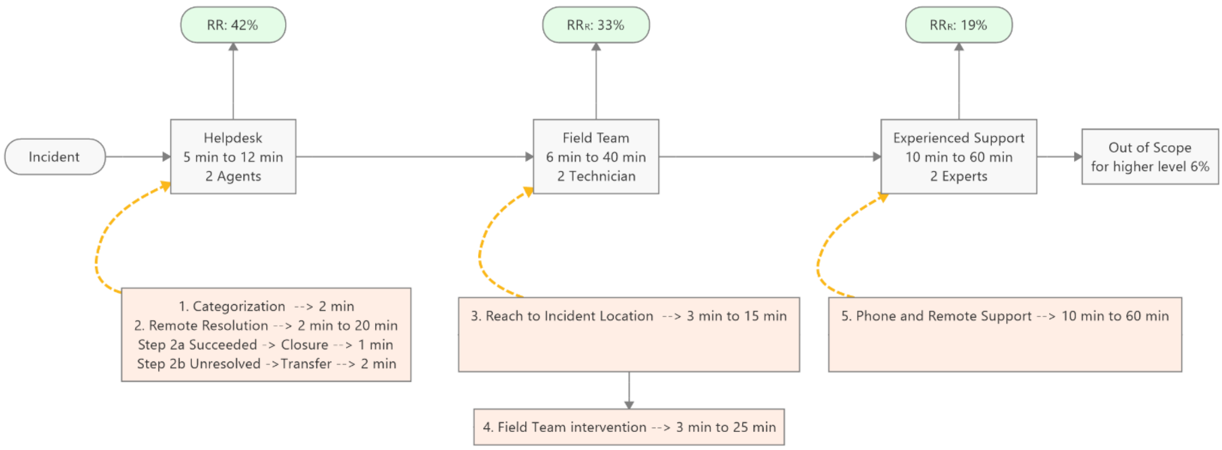


Figure 3. Simulation model sketch-up for Arena application

Many companies around the world develop common-use platforms under different brands. Furthermore, the support models for common-use systems are differentiating for each brand, and there will not be a specific approach. Some airports manage the common-use environment financially, and some have financing with cooperation between all airport parties, like airlines and handling agents. Some airports have been forced to use the common-use systems by default at the beginning of the rental period or built-operate-transfer model agreements with the owner. Each model has to be supported by the IT Service support on service agreements starting with different models. Some airports can buy the service with a complete package starting from the 1st level; some require only the 3rd level. Thus, this study offers a solution for airports that have asked only for 3rd level support and looking for check-in efficiency under their control.

Check-in agents do not care about the hardware availability and use this occasion as a complaints mechanism. The counter resource fees are at the forefront of service that each passenger, agent, or handling agent can use against any unwanted situation. Therefore, this study acknowledges that although the proposed results will help efficiency, it will not be easy to set up comprehensive certified end-user training. Nevertheless, it is better to change the approach for a sustainable approach.

RESULTS AND DISCUSSION

The data set for this study was used from actual airport data. Table 5, the below tableu, demonstrates the relation between flight count and incident structure monthly that are directly related to incidents with airport common-use reports. Those numbers are obtained from a middle-sized airport's IT department. Plenty of data is stored in the incident management for airport IT service since this is a systematic approach to identifying, classifying, assessing, resolving, recovering, and reviewing IT service for common-use check-in resources and processes.

The filtered data let results appear based on incident reports checked on the relation of flight counts and incident properties. There are three incident properties have been chosen below.

- *Failed Incidents* were incidents that were called the helpdesk by mistake or prematurely connected calls. The flight count correlation is 0.9 for this property.
- *Closed Incidents* are incidents directly related to common-use system problems with a correlation score of 0.94. This rate proves that all incidents have been correctly filtered.
- *Ongoing Incident* property is the worst and unrelated data from the filtered data by the correlation result of 0.16. Thus, this will not be used anymore in problem resolution.

Table 5. Filtered common-use check-in incident reports

Months	Flight Counts	Failed Incidents	Closed Incidents	Ongoing Incidents
January	5601	349	2558	217
February	5185	210	2021	58
March	5922	358	3447	188
April	6251	325	3657	77
May	7081	517	5239	230
June	7168	524	5596	102
July	8005	603	5735	268
August	8372	636	6221	103
September	7768	597	4918	75
October	7182	341	4584	247
November	5250	276	3271	135
December	6632	310	4297	111

The analyzed data shows in Figure 4 that the airport arrival and departure flight count and closed incidents are floating together like shadows. The departure flight count is the key for check-in operation IT Support due to the nature of the process. However, failed incident report support the necessity of the problem by effectiveness being the key to airport passenger operations. The high season is a considerable stress source for tourist airports. This airport doubles the passenger sum with higher load factors in the high season. So, the failed incidents peak in high season is the main reason for failed incident openings because of lack of readiness in the check-in counters. The other root cause of the high incident opening failures is because of inexperienced users during the high season who generally panic about dealing with different passenger requests while the pax queues grow longer.

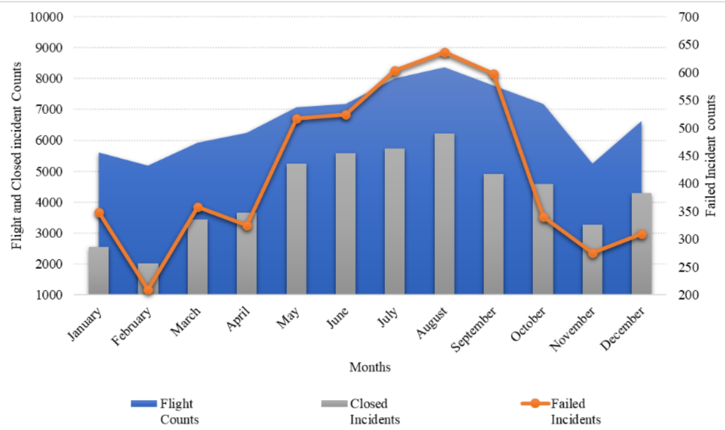


Figure 4. Analysis Results for airport IT Service desk incident records

There are two simulation results have been defined in the Arena Simulation application. The first simulation was carried out with the as-is model, and the second simulation considered that the educated staff gears the check-in operation. The main difference between these two models is the count of check-in operation count and calculating the workload as the time and queue of airport IT incidents on common-use devices. Both models were built on two field technicians and helpdesk agents counterbalancing the incident calls and successful closures. Also, both models were simulated a hundred times for accurate results.

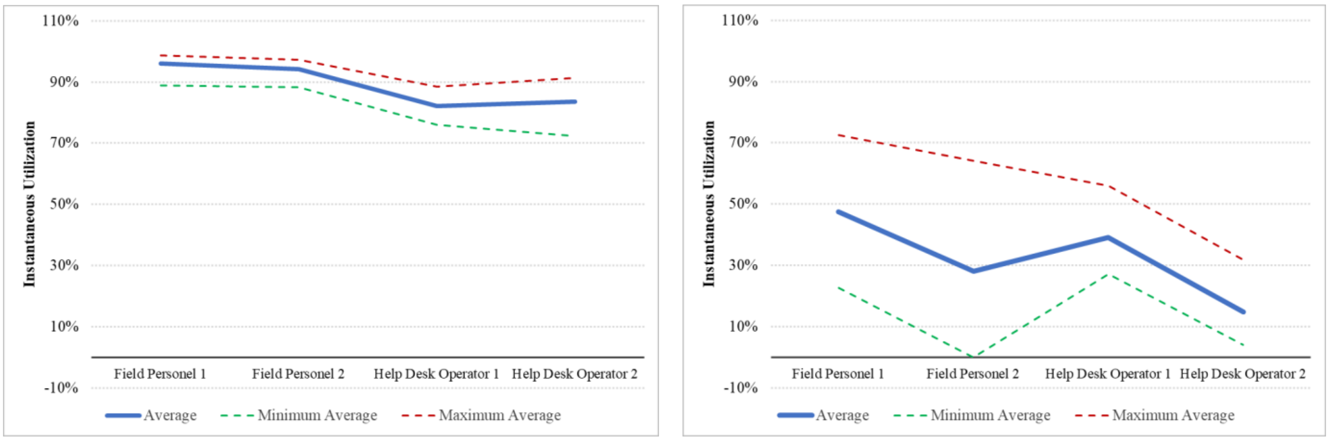
The simulation results have been assessed under two categories: Instantaneous Utilization and total utilization duration. Figure 5 represents the instantaneous utilization results of the simulation for both scenarios. The simulation results for the as-is scenario show that the utilization rate for all teams is at the highest rates, and Table 5 supports the waiting queue times in this regard. The higher reaching and problem-fix times trigger the unpleasant results of airport management. The average helpdesk response time can be increased to a minute; that would be the limit for just picking up a phone after the welcome message.

Nevertheless, the enormous problem is starting to add extra time by adding 26 minutes to 41 minutes for each incident. This figure's average is 26 minutes while the airport is in busy hours. The experienced field team's closure figures seem a disaster with 145 minutes of maximum average if the airport IT management increases the experienced staffing. It is also evident that the Experienced field team average reaches 95 minutes during busy airport hours.

When the simulation results were examined for data accuracy, the half-width figures showed as narrowing down the results is reliable. However, Figure 5 (b) shows that the minimum average and maximum average bands have become more expansive. Half-width figures for each analysis for both scenarios, the distribution width of each statistical distribution are standard and accurate. Furthermore, some half-width figures have shown a perfect fit after the improvement models simulations. These figures points-out that the resolution for time-critical problems should be resolved in the root cause.

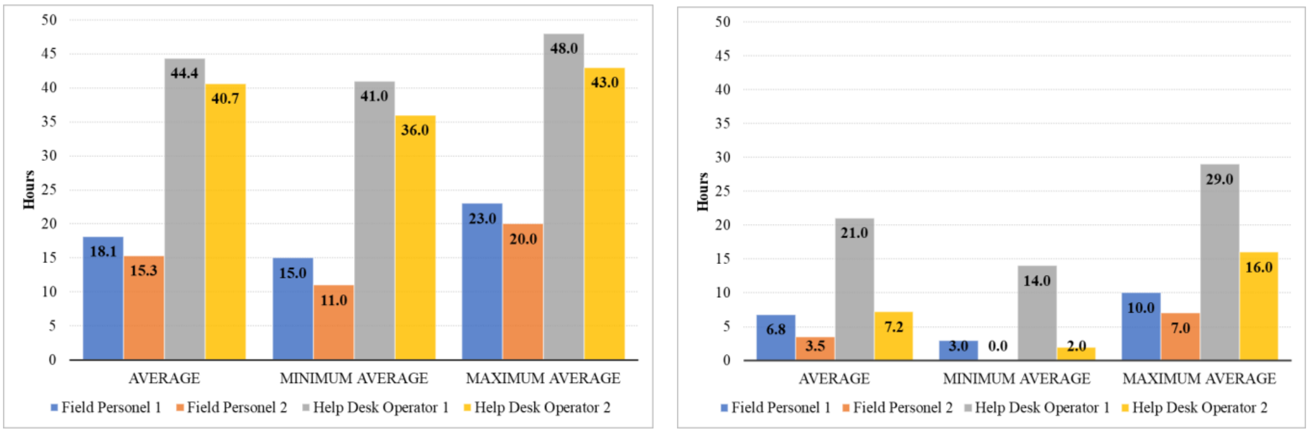
Table 6. Average Helpdesk waiting and Field Teams reaching durations for an incident

	Model As-is			**Model Improvement**		
	Average	**Minimum Average**	**Maximum Average**	**Average**	**Minimum Average**	**Maximum Average**
Experienced Field Team Queue	26 min	14 min	41 min	2 min	0 min	28 min
Field Team Queue	95 min	27 min	145 min	0 min	0 min	0 min
Help Desk Queue	24 sec	6 sec	59 sec	1 sec	0 min	11 sec



(a) (b)

Figure 5. Instantaneous Utilization results for Helpdesk and Field team, (a) Model As-Is, (b) Model Improvement



(a) (b)

Figure 6. Utilization Hours results for Helpdesk and Field team, (a) Model As-Is, (b) Model Improvement

CONCLUSION

Because the data were obtained using staff and system-specific attributes, the same analysis may be done even after capturing other key performance indicators such as the customer's origin and name. The airlines, the handling agents, and the airport's passenger transfer services may all use the results to modify the check-in procedure based on the time of day. In addition, considering that many business passengers do not check bags, self-service kiosks or fast-track check-in queues may be the most efficient check-in method for future services. The simulation results may be utilized to analyze the differences between the timeframes where the reports are provided.

Controlling the number of transactions processed at the transfer desk is an additional case choice. As mentioned earlier, this research has not examined any data to model the issue. The simulation might demonstrate the outcomes of such an analysis even when an airline elects to allow its passengers to check in earlier. If the necessary data is accessible, additional research may also consider airport IT personnel, passenger service staffing for airline or handling agent schedules, and scheduling considerations. This research had no possibility of obtaining these results at any point.

More studies are necessary to develop new strategies and not waste time on airport resources, handling agent resources as a staff efficiency and passenger satisfaction. IT support strategies may differ while applying copy-and-paste consultancy resolutions in specific environments like airport check-in counters. Many more novel approaches are needed as the airports are full of time-critical processes, IT, handling agents, terminal operators, and owner points of view.

This study intends to broaden the scope of airport research by including the planning and staffing of airport information technology services as part of developing check-in procedures. When this information is combined and acknowledged to fix another issue with the check-in procedure and the level of service provided, it is possible to understand a passenger’s complete experience and unlock another profitability metric at the airport.

Nomenclature

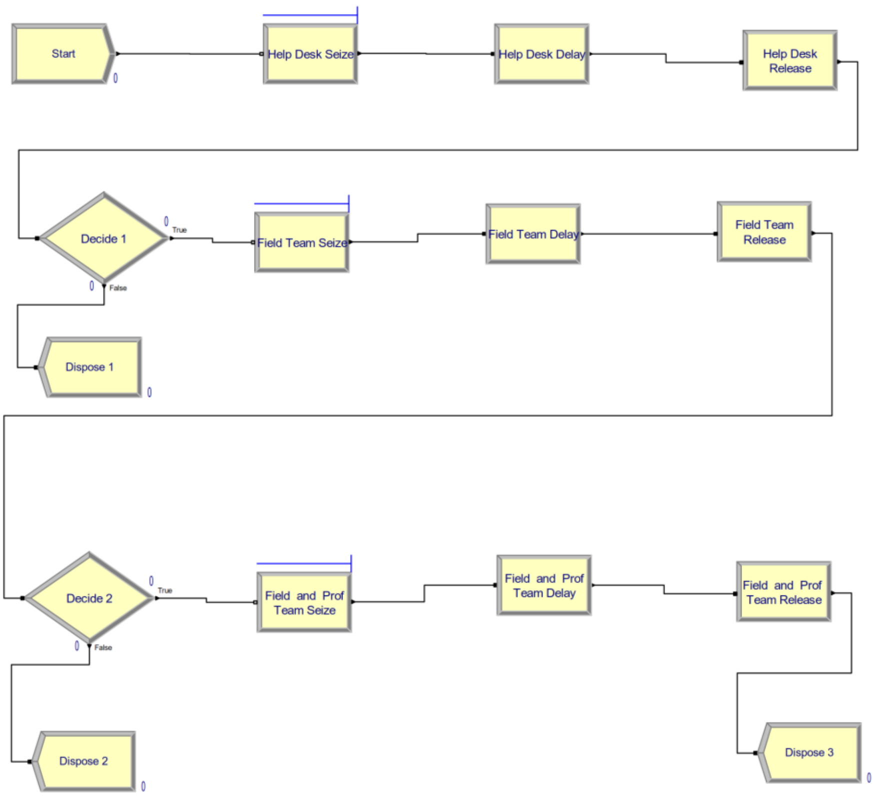
1st Level: Incident categorizing and initial troubleshooting level
2nd Level : Experienced technicians troubleshooting level
BT : Bilişim Teknolojileri
BTAK : Bilgi Teknolojisi Altyapı Kütüphanesi
CEO : Chief Executive Officer
CI : Configuration Item
CIO : Chief Information Officer
CM : Configuration Management
CMMI : Capability Maturity Model Integration
COBIT : Control Objectives for Information and related Technology
DCS : Departure Control System
GUI : Graphical User Interface
HD : Help Desk
IEEE : Institute of Electrical and Electronics Engineers
IM : Incident Management
ISO : International Standards Organization
IT : Information Technologies
ITIL : Information Technology Infrastructure Library
ITS : IT Services
ITSM : Information Technology Service Management
SLA : Service Level Aggreement
UI : User Interface

Symbols

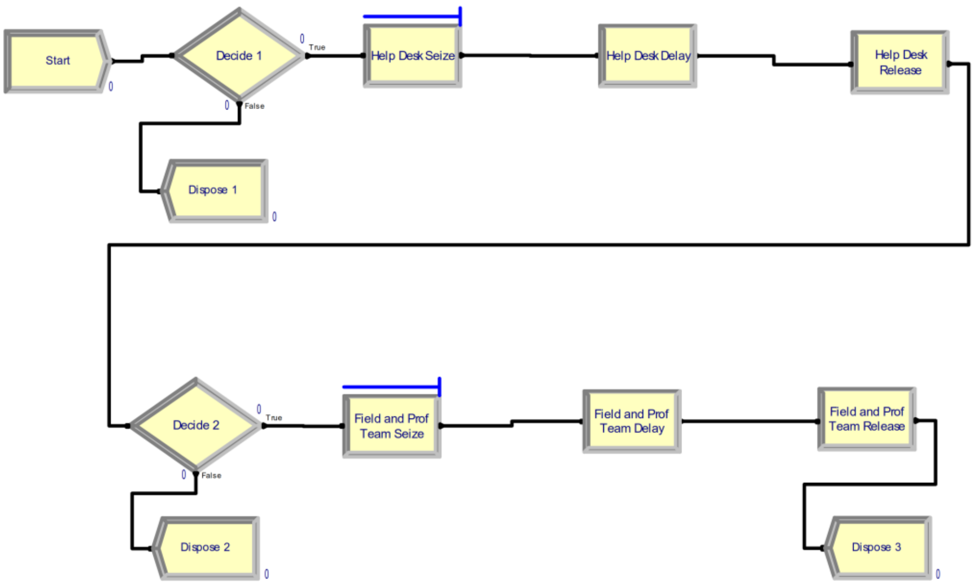
$\bar{t}_{1st}$: Average duration of the 1st level intervention
$\bar{t}_{2nd}$: Average duration of the 2nd level intervention
$\bar{t}_{HD}$: Average duration of the helpdesk intervention
t_{IR} : The measured duration of intervention request
t_{PR} : The measured duration of problem resolution finalized at 2nd level
t_{RR} : The measured duration of remote resolution

Appendixes

Appendix 1: Simulation diagram of as is.



Appendix 2: Simulation diagram of proposed solution



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