

Airport Information Systems—Airside Management Information Systems

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Abstract

Research on the intersection of the areas of aviation and management of information systems is scarce. Airports, more than ever before need to align their information systems to gain a competitive advantage and become more efficient in their operations. A proper classification is a prerequisite to systems alignment. The purpose of this paper is to provide descriptions of some of the airport management information systems, connections to or interoperability with other systems, and the key uses and users of each system. There are many types of management information systems and they can be organized or classified in a number of different ways. Furthermore, each system may or may not be necessary for a particular airport depending on the business goals and objectives and the certificate which the airport is operating under. Consequently, the system classification schema presented in this paper is neither all-inclusive nor exclusive; however, a number of leading aviation practitioners, business professionals, and educators in the industry were instrumental in both proposing and validating the schema. The study used interviews, documentation, and observation as the primary sources of data.

Keywords

Airport, Aviation, Management Information Systems, Airside

1. Introduction

In order for airports to be successful in today's competitive air transportation market, airport owners and operators need to align their management information systems to optimize operations, improve product distributions, improve customer relations, reduce overhead, and increase revenues [4]. A proper classification is a prerequisite to systems alignment.

Research on the intersection of the areas of aviation and management of information systems is scarce. The

purpose of this paper is to contribute to the body of knowledge by providing descriptions of airport management information systems, their interoperability with other systems, and the key uses and users of each system. There are many types of management information systems and they can be organized or classified in a number of different ways [1] [2]. Furthermore, each system may or may not be necessary for a particular airport depending on the business goals and objectives and the certificate which the airport is operating under. Consequently, the system classification schema presented in this paper is neither all-inclusive nor exclusive; however, a number of leading aviation practitioners, business professionals, and educators in the industry were instrumental in both proposing and validating the schema. The study used interviews, documentation, and observation as the primary sources of data. This paper is concerned with key Airside Management Information Systems.

Airside Management Information Systems facilitate the airport and airline operations required to process aircraft, passengers, and air cargo. They involve the ticketing of air travelers, ground movement of aircraft and vehicles, flight procedures of aircraft within airport airspace, and scheduling and managing of boarding and gate equipment, and weather updates.

The airside management information systems covered in this paper are: Gate Management System, Aircraft Fuelling System, Air Traffic Control (ATC) System, Weather Monitoring System, Airfield Lighting System, and Automatic Vehicle Identification (AVI) System [1].

2. Methodology

This study uses naturalistic inquiry to elicit data related to the classification and use of Airside Management Information Systems. The qualitative study collected data using observations, interviews, and document analysis in order to answer the research questions. Twenty-one extensive interviews were conducted with senior airport officials and IT directors from four US international airports and aviation faculty in Embry-Riddle Aeronautical University. A systematic search for the entire data corpus was conducted and data categories were created. Constant comparative method of data analysis was used (Merriam, 2001). The constant comparative method is a technique often used in the grounded theory tradition of qualitative research. It involves systematic search and arrangement of field notes and other data accumulated into categories in order to increase the understanding of the situation. In reviewing the field notes, the researcher generated and tested assertions by looking for key linkages and conducting member checks.

3. Gate Management System

The Gate Management System encompasses the management of airport terminal and ramp equipment and systems, including the efficient scheduling of gates for parking arriving aircraft and controlling terminal and ramp display equipment for directions and information. The Gate Management System employs software programs designed to facilitate the management of airport flight and gate operations. This system is capable of controlling all aspects of ticketing and boarding operations and of displaying information on the Check-In Desk Dynamic Display System (CDDDS) at ticket counter check-in areas. The Gate Management System controls the scheduling and allocation of resources. An airport provides airline tenants with passenger ticketing lobby spaces, boarding gates, baggage claim belts, and aircraft parking spaces. However, the equipment and amount space allocated to an airline is determined by its tenant lease agreement with the airport.

Airlines use flight scheduling software such Gate Keeper[®] or Sabre[®] to schedule all of their flights, and the Gate Management System uses the airlines' flight schedules to create the schedules sent to the airport's common-use equipment. Data from the scheduling software are imported into the Gate Management System to allow the matching of scheduled flights with airport gates and flight-processing systems [3]. In an exclusive-use arrangement, an airline's flight scheduling system schedules all aspects of each flight, including the equipment, boarding gates, and baggage claim belts. Under common-use agreements, the Gate Management System receives flight schedules for each airline and schedules the common-use equipment needed to support each flight. The system uses predefined airport operational rules (e.g., number of gates to schedule at a concourse based on the types and size of aircraft) to determine the optimal allocation of boarding gates and the aircraft ramp parking areas.

The Gate Management System calculates gate capacity and determines when aircraft can be scheduled and assigned to gates based on projected airline traffic. The system is also used for scheduling gate usage based on aircraft type, specifically size and category, to ensure compatibility. Data feeds from other aviation information

systems, such as the Flight Information Display System (FIDS), and Federal Aviation Administration (FAA) flight databases ensure up-to-the-minute flight status on arriving aircraft. If properly configured, the Gate Management System reduces operational costs and improves efficiency by automating the scheduling of airport equipment. Gate Management Systems can also generate historical reports for equipment-usage for each asset programmed into the system allowing efficient use of airport resources. Gate Management Systems require computer applications, either as complete software suites or as individual applications or modules incorporated into other airside operations management software. For instance, software modules may include the following: Boarding and ramp gate resource scheduling modules, baggage belt systems resource scheduling, and common-use ticketing equipment.

The Gate Management System has a Graphical User Interface (GUI) that allows key users to manually input rules (*i.e.*, conditions for use of equipment) and flight schedules to adjust equipment usages. The GUI allows the system operator to see all of the flight data imported into the system and the equipment that has been allocated for each flight. Conflicts in equipment scheduling are displayed, so system operators can make appropriate adjustments rapidly. Each airline provides a data feed into the Gate Management System that consists of their flight schedule up to 30 days in advance. However, the gate management software also allows users to import flight schedules manually for airlines with unscheduled flight services at the airport. An operator simply logs into the Gate Management System and chooses from several integrated functions such as configuration management, scheduling, gate management, ticket-counter management, and baggage-claim carousel management. Users monitoring the Gate Management System are able to track daily operations in these areas to ensure each area continues to operate efficiently and without conflicts. Because specialized equipment is not required, the Gate Management System can run on the airport's existing IT network. The system connects via a Local Area Network (LAN) or via a Wireless LANS (WLANS) to other airport systems such as CUPPS, MUFIDS, and BIDS to provide information and allow for scheduling of airport resources. The Gate Management System typically stores predefined processes (instructions) and airport asset information in a Relational Database Management System (RDBMS). These data provide the basis for the instructions generated for scheduling airport equipment based on airline flight information. Airline flight schedules stored in an airline database are imported into the gate management application for short-term storage of flight data. Because the gate management application does not change airline flight schedules, it is not necessary to maintain long-term storage of any flight data in the database. Some examples of gate management software provided by outside contractors include: Smart Airport Operations Center (Ascent Technology), Rapid Gate (Inter Systems): and TMS-Gate (Jeppesen).

4. Aircraft Fueling System

The Aircraft Fuelling System encompasses the coordination of efficient delivery scheduling, distribution, and monitoring of fuel stored at airport fuel farms and delivered to aircraft and operations vehicles; thus, optimizing aviation fuel purchasing and billing. The Aircraft Fuelling System includes the airport's fuel farm stations where the large-capacity storage tanks are located. A major commercial airport usually has several fuel farms. Although they are situated on airport property, they may be managed and operated by the airlines or by third parties.

Regardless of the number of fuel farms or who manages them, a control system is required to both manage and monitor fuel-farm operations. Most large airports have an underground fuel supply system consisting of network control and monitoring systems connected to fuel lines running underground from the fuel farm to aircraft gate areas on the parking ramp, which could be some distance apart. Fuel is pumped to aircraft through hoses connected to the underground fuel hydrant system. A computer system regulates the precise movement of fuel from the fuel farms based on input received from several sources including the host application, fuel-flow devices, and status monitoring devices. Typically, fuel-flow devices have a mobile computer that regulates the amount of fuel supplied to an aircraft based on pre-programmed parameters used in calculating the correct fuel load requirements for the aircraft type and the upcoming flight route. Before an airplane is refueled, the fuelling operator logs into the airport's fuel information system on a mobile terminal connected to the host system and downloads the fuel configuration for the aircraft. Then as the operator refuels the airplane, the device tracks the quantity of fuel pumped to the airplane and sends that data back to the host fuel system via wireless transmission. Safe and efficient operations of a fuel farm require strict management from the time a pipeline or fueling tanker delivers the fuel to the storage tanks to the time an aircraft receives the fuel at a gate. These systems provide

services such as real-time inventory reports needed to track daily usage by individual airlines as well as the continuous monitoring of offloading and storing processes necessary to prevent tank overfills and fuel spills. Fuel information systems can perform simple sensor monitoring of inventory levels in addition to more complex operations that integrate various supply chain partners. Integrated systems handle automated ordering based on inventory levels to ensure the storage tanks always have enough fuel for regular and contingency operations and to ensure optimal supplies from tanker truck or pipeline deliveries. These integrated information systems also maintain optimal efficiency through tank-level monitoring and pressure-flow monitoring. They also allow fuel farm operators to detect leaks in the systems, flow pressure issues, and other events that could lead to potential unsafe conditions or hazards during fueling operations. The Aircraft Fuel System provides the opportunity to optimize fuel costs by identifying trends in utilization and performance. Reporting systems provide information used to improve decision making in all fueling operations and in allocation of labor and equipment resources. This adds value to the airport and airlines by enabling safe and efficient fueling operations and effective supply-chain management processes. Billing for the fuel purchased by each airline is administered through the airport's Revenue Management System. These reports enable accurate and timely billing for efficient revenue management. Airport operators may also use the system to analyze fuel costs and supply quantities to optimize purchasing fuel during low cost periods; thus, increasing revenue. Fuel systems utilize either standalone software or separate applications or modules integrated into the airport's operational software suite or integrated with financial and other asset management software. Software applications can vary by vendor and the type of system installed. For example, an application like COSTAS AFMS by Mess—und Fördertechnik Gwinner allows users to configure the system based on the equipment and parameters established by the fuel system administrator. These parameters monitor fuel levels, detect fuel leaks in the system, and monitoring the status of other equipment connected to the system. The database connected to the fueling system stores data generated from all of the connected devices, and user-input information on fueling equipment, supply tank capacities, authorized system users, supply chain vendors, and rules for system operation.

5. Air Traffic Control System

The Air Traffic Control (ATC) System encompasses the FAA personnel and equipment used to manage and coordinate the safe and efficient movement of all (a) aircraft in controlled airspace, (b) aircraft and vehicles on airport runways and taxiways, and (c) aircraft operations and maintenance operations in airport movement areas. The primary purpose of the ATC System is to maintain safe separation of air traffic and to manage the safe and efficient movement of aircraft and vehicle traffic in aircraft movement areas to prevent runway and taxiway incursions. This system is comprised of Very-High Frequency [VHF] radio systems, computer radar systems (Surface Movement Radar [SMR]), navigational equipment, ATC facilities, and ATC personnel. Each component plays an important role in enhancing air travel safety [5]. However, the relationships between ATC and the airports that depend on it are complicated because both are responsible for providing a safe operating environment for aircraft and airport personnel.

Some of the ATC System technologies include, but are not limited to, the following: Airport Surface Detection Equipment (ASDE): This surveillance system is comprised of radar and satellite technology that enables air traffic controllers to track the surface movement of aircraft and ground vehicles; Radar Data Processing & Display System (RDPDS): This system processes radar data received from various primary and secondary radars to present the aircraft position and relevant information (e.g., aircraft call sign, altitude, ground speed, aircraft category) on the radar display. Air traffic controllers use this information to control approach, departure, terminal, and enroute air traffic; Flight Data Processing System (FDPS): This system processes flight-plan data from aeronautical messages and it automatically prints the flight progress strips for use by air traffic controllers to assist in updating and monitoring of the aircraft flight profile: the estimated departure time, flight route, flight level, expected times at reporting points, cruising speed, and estimated arrival time; Surface Movement Radar (SMR): This radar is mounted on top of the control tower to provide surveillance of the movement of aircraft and vehicles on the airport runways and taxiways. It provides accurate movement information, enabling tower controllers to maintain a smooth flow of traffic during low visibility or darkness; Instrument Landing System (ILS): This system provides precision landing aids for accurate azimuth and descent guidance signals used by aircraft for landing under both normal and adverse weather conditions; Precision Runway Monitor (PRM): This is a Monopulse Secondary Surveillance Radar (MSSR) that has electronically-scanned antennas configured in a

circular array. The PRM system can search, track, process, and display MSSR-equipped aircraft within airport airspace within 32 nautical miles in range and within 15,000 feet in elevation from the airport runways.

These technologically advanced equipment systems are used by ATC, airlines, and airports to aid the safe movement of aircraft, so they must be of the highest accuracy and reliability.

Airports and airlines also depend on ATC equipment for real-time flight status of aircraft and current weather conditions. The FAA weather monitoring systems installed throughout the U.S. provide advanced warning to ATC, so pilots can receive early notification of inclement weather and change flight plans as dictated by safety. This weather information is shared with airport operators so they can implement procedures for irregular operations before inclement weather impacts the airport. Airport operators are also required to implement and maintain a Notice to Airman Systems (NOTAMS) to inform ATC controllers and aircraft pilots of changes in conditions on airport runways and taxiway systems. Weather notifications may be manual or automated. Manually transmitted information is faxed to ATC and airline operational centers. Key users can opt to have this information automatically emailed to them or imported into the ATC System and each airline's system of choice.

The ATC System utilizes computer-based systems to provide information to ATC controllers and to the systems providing operational guidance for ATC and aircraft pilots. Data generated by the ATC System facilitates separation of aircraft, efficient flow of air traffic in ATC-controlled space, and coordination of ground movements of aircraft and vehicles. The FAA also provides data feeds for airports, airlines, and the companies that produce aviation-related software integrated into airport and airline systems. Data generated by the ATC System allows airports to plan and prepare for irregular operations, such as forecasted snow events or thunderstorms, that might require aircraft to divert to alternate airports, resulting in unscheduled aircraft arrivals. Planning, preparation, and coordination with the ATC System help improve overall airport operations. Weather information systems used by ATC provide real-time weather status through commercial-off-the-shelf (COTS) applications such as AWOS or through customized applications such as National Airspace System (NAS) Status. Other software applications provide aircraft tracking, control of navigational equipment, and surface detection systems. The hardware equipment utilized in the ATC System is specific to each component system and its intended application. Each connected system uses specialized field and computer hardware for data reporting. Airports are not permitted direct access or input to this computer hardware. Specifics on ATC hardware and networks are not made public. The ATC System operates on FAA networks that are not connected to any airport network. Data generated by FAA systems are, however, available to airports via connections to open databases set up by the FAA for airports, airlines, and vendors providing or requiring access to the FAA flight-scheduling systems. Applications such as Aero Bahn and Flight Explorer import ATC data to track aircraft ground movements and aircraft flight progress from take-off (departures) to landing (arrivals). The FAA databases store flight schedules, actual take-off and landing times, aircraft type, the names of and information on airlines, airports, airport configurations, airfield configurations (*i.e.*, number and names of all runways and taxiways), airfield lighting specifications, and other flight related data. Any airport operator can request FAA data feeds to supply relevant information to their MUFIDS, BIDS, and the Gate Management System.

6. Weather Monitoring Systems

The Weather Monitoring System consists of a combination of computer-based systems and weather equipment, such as weather antennas and sensors, that provide current and forecasted weather conditions for the airport vicinity and ground and surface temperatures for the aircraft movement areas, public roadways, and bridges. Continuous weather monitoring is important for all operations at every airport in the National Airspace System (NAS). Weather conditions affect aircraft departures, enroute travel, and landing operations as well as airport terminal facility operations. Inclement weather that grounds or cancels flights, causes delays in traffic on airport roadways; increases the number of passengers in terminal buildings and concourses, which in turn increases demand on facilities, restaurants, and stores; increases use of airport systems such as heating and air ventilation systems; and increases demand on human resources to ensure passengers are being serviced and the airport is being maintained properly. Therefore, having advance notification of when inclement weather systems should help optimize airport operations, allowing airport operators to ensure resources, procedures, and processes are in place ahead of time [2].

Airport Weather Monitoring Systems include a variety of equipment for monitoring weather and airport surface temperatures. Snow and de-ice operations require constant monitoring and measurement of surface temper-

atures and precipitation accumulation rates. Airports use a combination of digital temperature measuring devices and skid calibration vehicles to determine when runways and taxiways need to have chemicals added for reducing or removing snow and ice from the areas where aircraft and service vehicles travel. Data generated by these devices allow airports to develop priorities for cleaning runways and taxiways to enable aircraft operations to continue as scheduled. Any one of several systems can provide real-time weather data to airports. Data feeds from Internet sources such as NOAA, the Weather Channel[®], and Weather Bug[®] all report weather information. An airport may also integrate the computer code (e.g., markup language or HTML) or RSS feeds from diverse sources such as Yahoo[®] and NOAA to provide weather updates and forecasts on the airport website. Most often, weather feeds are free for airports to deploy, because advertising revenues subsidize the cost of hosting the website.

A second option available to airports is the purchase of weather software systems that can be maintained by the airport operator. These types of systems include the purchase and installation of hardware systems that monitor and detect current weather and predict changes in weather patterns. Systems such as Automate Weather Observation Systems (AWOS) provide accurate real-time weather information. The hardware includes towers with sensors that monitor temperature, wind speed, precipitation accumulation, and barometric pressure. High-end systems, such as AWOS, also include features that allow for the transmission of weather information to airport computer systems, airport UHF and VHF radio systems, and the NOTAM service. Advanced systems also collect and report the following data: Wind direction, Visibility, Runway Visual Range (RVR) Conditions, ATC conditions, Density altitude, Air temperature, Dew point temperature, cloud height and sky cover including obscuration.

A third option is obtaining certified weather reports from the FAA or the airlines. This option is popular with airports because the accuracy of current weather data and forecasts is very reliable. Weather data are vital to the safety of daily airport and airline operations. A Weather Monitoring System improves safety by allowing airport and airline personnel to prepare airside and landside equipment, employees, and facilities for inclement weather operations. Deviations in scheduled flights incur additional costs to airlines for the extra fuel used for late arrivals and departures. Schedule deviations affect airlines and the airport facilities, gates, and systems used to service flights. Therefore, early notifications of incoming inclement weather can reduce the potential impacts on airport operations; thus, reducing airline and airport operating costs. Weather information may be displayed on dynamic signs in retail areas, airport transportation systems, parking lots, cell-phone parking lots, and other areas frequented by employees or customers. Airport and airline employees use the Weather Monitoring System to prepare equipment and facilities for anticipated weather to maintain the safety of employees, passengers, and visitors. Airport weather-reporting systems include RSS feeds, websites, AWOS, coordinated airline and FAA systems, and airport equipment. As previously mentioned, weather data may also originate from any number of Internet websites including Yahoo[®], Google[®], MSN[®], or other Internet websites. Airports can also download and install apps from vendors such as Weather Bug or the Weather Channel to display information on their websites and display systems. If the airport owns and operates its Weather Monitoring System, application software provided by the vendor will have a GUI installed with custom configurations (settings) for the airport. Once installed, this type of system allows key users to track weather activity and to see the direction and speed of incoming inclement weather. Other software systems such as Vaisala AviMet[®] Aviation Weather provide modular applications that allow airport users to define the perimeters for status monitoring.

7. Airfield Lighting Systems

The Airfield Lighting System encompasses the lights installed on airport taxiways, runways, and some ramp areas that provide location and direction information to aircraft pilots, maintenance workers, aircraft mechanics, and FAA control-tower personnel during times of reduced visibility to facilitate safe operations. Airports also have navigation lighting systems that the FAA both maintains and operates. These systems include approach lighting systems and beacon lights that aid aircraft movement, but are not covered in this book.

Most commercial airports operate 365 days a year under virtually all weather conditions. Normal daylight conditions are increasingly requiring additional lighting for aircraft taxi, take-off and landing operations. Additional lighting is required for aircraft operations during hours of reduced visibility (*i.e.*, dusk to dawn) and during other conditions that reduce the visibility at the airport (e.g., fog, rain, snow, smog). Airports certified and operating under Federal Aviation Regulation (FAR) Part 139 are required to have Airfield Lighting Systems to aid

in the safe movement of aircraft and support vehicles. These airports service scheduled air carrier operations, aircraft certificated to transport between 9 to 31 passengers. The FAA establishes the standards and guidance for airport lighting systems in Advisory Circulars (ACs). Advisory circulars provide detailed instructions for the design, installation, and maintenance of airport lighting systems. For example, AC-150/5345-43G: Specification for Obstruction Lighting Equipment provides the specifications mandated for lights on runways and taxiways including the colors and materials of the lights and their housings.

The Airfield Lighting System includes lights, connectors, cabling, sensors, and computer hardware, and software. The number of lights in an Airfield Lighting System can range from a few hundred to a few thousand depending on the size of the airport and the number and length of the runways and taxiways. These lights are controlled by a computer system programmed to auto adjust the lighting levels based operational requirements and detected weather and visibility conditions. Also, FAA tower controllers and airport maintenance personnel can manually control airfield lighting as needed. Airfield Lighting System includes electrical systems controlled by control and monitoring computer software. Although the software applications differ somewhat by vendor, they perform the same function of controlling light levels on the airport's airfield. Most software applications come with a GUI that enables touch-control operation of the system. For example, systems such as ALCMS (ADB) or DCCMS (Crouse Hinds) allow operators to control individual areas of the airfield as well as all areas of the airfield through use of a touch screen monitor that displays a map of the airfield. This type of software system also provides visual notifications of individual or multiple light outages and can send notifications automatically whenever conditions change within the system. These software applications can also be integrated with the airport's maintenance reporting system to automate service maintenance requests. The database stores information on the connected equipment and on the configuration settings for different weather and visibility conditions. Users have the option of storing information on the manufacturer's in-house database or on their SQL, Oracle, or ODBC database integrated into the airport lighting software application. The database stores and displays relevant information on the types of lights, runways, and taxiways, power distribution tables, cabling distribution tables, computer workstation configurations, and authorized users. Typically, an airport Airfield Lighting System is proprietary.

8. Automatic Vehicle Identification Systems (AVI)

The Automatic Vehicle Identification (AVI) System encompasses the special Radio Frequency Identification (RFID) hardware installed in vehicles and the computers operating data collection and system management software used for identifying, tracking, and recording vehicle movements at an airport. The AVI system utilizes RFID-based equipment to track resources to both monitor and control restricted access points. The AVI system monitors, identifies, and collects information on the overall movement of airport ground traffic as well as the position and movement of individual vehicles.

Efficient use of resources is a major factor in an airport's operating at peak efficiency. Airport operators and managers are becoming more aggressive in tracking resource usages to ensure airport equipment is used for its intended purpose and is used within the manufacturer's standard operating procedures (SOP) and airport guidelines. Furthermore, workers are incentivized to operate within these parameters by knowing operations managers can see the present and past locations of vehicles installed with RFID tags being monitored by the AVI system. Airports may also use RF tags in emergency-response vehicles required to access runways and taxiways. Monitoring vehicles in proximity to restricted areas such as runways and taxiways helps to prevent incursions in restricted access areas where aircraft are taking off or landing. When the AVI System is used in this capacity, operations personnel are immediately alerted of an intrusion or unauthorized breach, which allows for intervention before an aircraft incursion, occurs.

The AVI System can be used to track the movement of delivery and service personnel who are required to transit airport service roads, although most airports require authorized escorts for these types of service visits. If the airport has an AVI system, an RF transponder can be assigned to the service vehicle's driver, so the vehicle's movements can be automatically tracked from the airport access point, throughout a designated route to the service location, and then on the exit route. Individuals monitoring the vehicle are immediately alerted to any deviations from the assigned route; thus, allowing immediate intervention should the need arise. This practice allows for the supervised movement of vehicles without the need for escorts; thus, freeing up valuable airport and airline resources. Emergency-response vehicles such as Aircraft Rescue and Firefighting (ARF) trucks, police cars,

and other first-responder units must arrive on scene within a very short time from the time of the incident notification. The AVI equipment installed in the emergency vehicles improves response times by informing incident commanders and first responders of the fastest routes to the scene.

On the airport landside, the AVI System assists the management of the commercial ground transportation system. Operators of commercial vehicles such as taxis, limousines, and shuttle buses pay fees to integrate within the airport's commercial ground transportation system. Permitting commercial transportation companies to conduct revenue-generating business at the airport satisfies a valuable need for airport customers. However, the management of these vehicles, especially at large airports, can be quite labor-intensive because the airport must account for each vehicle every time it accesses airport property, which is many times a day. Vehicle tracking data are needed because fee rates are tiered to usage rates, and this commercial fee information is needed in projecting airport revenue. Companies approved to conduct commercial ground transportation services are issued RF transponders that provide access to the commercial vehicle area and that track the number of commercial visits per vehicle. Based on the particular licensing agreement with the airport, commercial operators pay a monthly charge upfront or they are billed at the end of the month based on the number of times the vehicle(s) accessed the commercial area. Processing commercial invoices and collecting fees is automated when the AVI system is integrated with the airport Revenue Management System. The AVI System provides several benefits besides improving roadway congestion and providing monitoring of airport resources without the need for human intervention. The system brings real-time vehicle movement data and decision makers together by reporting transactions to multiple systems and their managers. For example, integration with the airport Revenue Management System allows AVI data to be used for budget planning and airport roadway improvement projects. Indeed, the AVI data can be fed into maintenance systems, operational systems, airfield-monitoring systems, vehicle access systems, and revenue tracking and generating systems. AVIs require software to both track AVI tags and RFID tags installed or carried in vehicles and to control entry gates for restricted areas. The software can be integrated into Asset Management System, parking control system, and Revenue Management System. Hardware for the AVI system includes a combination of RF tags (transponders) installed in vehicles for the purpose of tracking the vehicle's movement and authorizing automated access to areas monitored by AVI transponders, track readers, long-range RFID readers, and heavy-duty RFID readers. The system includes computer servers and workstations for hosting the application and providing multiple user access at workstations throughout the airport. The AVI System communicates via the airport's LANS and WLANS to monitor and track the RF tags installed in vehicles moving around the airport. The AVI database collects and stores information received from the transponders and from the software application. Data collected by the system includes traffic numbers, traffic capacity times, vehicle entry and exit numbers, airfield vehicle access numbers, and the locations of RF-tagged vehicles.

9. Conclusion

Airports use a myriad of systems to support their operations. Many of those systems are now incorporating software, database, and network components. They generate both on-demand and regular reports to assist airport management, improve operations and reduce cost at the same time. In order for airports to become more effective and efficient in their operations, they need to understand the competitive advantage of these systems and how to align them together to better serve their stakeholders. This paper provides a possible classification for airport airside management information systems and describes some of their use.

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