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A Feasibility Study on the Automation of Domestic Airline Passenger Customer Service Check-In Procedures for FAR Part 121 Carriers

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A FEASIBILITY STUDY ON THE AUTOMATION OF DOMESTIC AIRLINE PASSENGER CUSTOMER SERVICE CHECK-IN PROCEDURES FOR FAR PART 121 CARRIERS

by
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Abstract

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This study was conducted in an attempt to determine whether airlines can benefit from a fully automated customer service system which will be used by major, Part 121, operators for domestic travel purposes only. The proposed system will be designed to alleviate airport terminals check-in counter congestion and improve customer service personnel effectiveness and efficiency.

Domestic traffic is expected to increase by 50 percent by the year 2004. An Automatic Ticketing and Baggage (ATB) system will allow passengers to process all flight related transactions only once. A self checking-in system allows a passenger to obtain boarding passes and destination bag tags. From there the passenger simply boards the aircraft. This can be accomplished without the interaction of airline employees who can be deployed to handle more critical matters. With the introduction of an automated system, it is anticipated that there will be little need for additional passenger processing facilities such as land-side expansion or other major infrastructure. Employing a questionnaire survey, the author attempted to determine if a need exists for such a system.

The automated system will be used by frequent fliers, particularly business travelers and other "seasoned" passengers who travel under time constraints. Current

check-in procedures can be time consuming and stressful. The user-friendly system will be located at strategic points where high utilization will be expected. Possible locations for an automated check-in system include curbside check-in, strategic points within the terminal buildings, and areas within the sterile holding area. Vendors are available that can provide the already existing hardware and software needed to implement the system.

TABLE OF CONTENTS

LIST OF TABLES

Introduction

The airport system in the United States (US) is poised for growth into the next century. US. domestic traffic is expected to grow just over four percent a year on average between 1993 and 2004 (Mann, 1993). Accordingly, projections for total enplanements indicate that, by the year 2000, demand will double from the 1990 amounts (DOT, 1989). In 1990 domestic enplanements stood at 456 million and are expected to exceed 935 million by the year 2005, placing added demands on an already strained system (FAA, 1990). Changes in air transportation can open new profit opportunities. Since passage of the 1987 Deregulation Act, the aviation industry, particularly FAR part 121 operators, had embraced a philosophy of interacting technological innovation, social change, and the consequent continued need for business and industry to rethink roles and opportunities in a changing environment.

There are ongoing efforts within the aviation and aerospace industry to improve, via automation, various systems ranging from Air Traffic Control (ATC), aircraft, baggage handling, catering, and cargo operations. Moreover, airlines are unable to afford the escalating high costs associated with customer operations and are looking for ways to process people quickly and efficiently. With the current economic trend of unsecured leases, and airlines not being committed to airports, airports can no longer commit an air carrier to invest in additional terminal space, let alone extended leases. If passengers have a neutral airport experience, at least they may remember the good parts of their flight (Lyon, 1990).

An automated system will not eliminate jobs or the need for human interaction. It will be used to improve the efficiency of customer relations and facilitate the efficient utilization of personnel. To realize the relationship between customer service and automation, airlines will have to move away from their traditional roles as providers of personal service towards a new role as problem identifiers and creative problem solvers. This will mean using technology to achieve this goal, relieving personnel from existing routine functions so that time is available where it is most beneficial. The way to achieve high-octane power in the airline industry is to know when personal contact is necessary, to automate functions that lend themselves to automation that can be accomplished without personal contact, and to concentrate personal contact where it will produce the most benefits (MacPherson, 1993). Where personal contact is deployed, high value, not high volume, will mean ranking the quality of relationships with customers over the amount of time taken to process a passenger.

The proposed system should possess capabilities to obtain inter-airline information. There are vendors available to provide the necessary hardware. The technology already exists that can be used to implement this system. Although the venture into airport automation has been slowed by the airline industry's recent financial woes, the networked personal computers now appearing in new terminals around the world, and the expanded use of fiber optics, are whetting appetites for enhanced capabilities (Henderson, 1992). Terminal operations will see many dramatic improvements. Mainly, there will be less need for additional space allocated to check-in procedures and greater utilization of already existing check-in options.

A new definition of customer service is emerging, one that goes beyond doing it right the first time, providing communication excellence, on-time deliveries, and being responsive to individual customer requirements. All these are starting points for service in the 1990s (Graham, 1994). Service for the future means becoming a valuable resource for the customer. Effective customer service today must be equated with knowledge, information and expertise (Graham, 1994). Automation allows the right resources to be in place at a given time.

Statement of the Problem

The service industry is a complicated business and the aviation industry is not exempt from the complications that can arise when dealing with a consumer oriented service. There are few easy answers to the many operational and regulatory issues that confront the aviation industry. Finding ways to deliver quality service without increasing costs is making successful services, and their suppliers, less wasteful and more innovative than ever before. Companies have learned that assigning more people to solve a problem only creates new ones.

This study was conducted to determine whether an automated system could improve the processing of passengers in a cost effective and efficient manner. Because of the continuing high costs associated with customer processing procedures a need exists to modernize the existing system. The benefits of this new system include improved airline security, timely flight departures, and improved resolution of customer related matters. Airports themselves will benefit from the system. There will be a reduced need for additional land side concrete.

Limitations

The proposed system will be limited to domestic carriers serving large hub airports. Beginning January 1, 1981, "domestic" encompasses operations within and between the 50 States of the United States, the District of Columbia, the Commonwealth of Puerto Rico and the United States Virgin Islands. It also encompasses Canadian transborder operations and, for certain carriers, Mexican transborder operations. All other operations are considered "international". To be classified as a Part 121 operator a carrier has to have an annual operating revenue of one billion dollars, with airplanes having a seating capacity of more than 30 passenger or a maximum payload capacity of more than 7,500 pounds.

This study, limited to domestic carriers and conducted in the State of Florida, concentrated on the larger carriers including American Airlines (AA), Continental Airlines (CO), Delta Airlines (DL), Northwest Airlines (NW), United Air Lines (UAL), USAir (US) and Trans World Airlines (TWA). Florida was chosen because Miami International Airport (MIA) and Orlando International Airport (MCO) are among the top thirty airports in the US, ranked numbers seven and eighteen respectively. In 1994 MIA enplaned 30,203,269 passengers and MCO 22,347,412 passengers.

Florida is a gateway to the US for international flights from which passengers can easily transfer to domestic flights. Other airports in the state, such as, Tampa International, Jacksonville International, and Fort Lauderdale-Hollywood International airports also serve as major points of destination for passengers. The abundance of major airports in the state, 11 in total, did not minimize the difficulty in conducting the study.

It was difficult to obtain the correct names, titles, and mailing address of individuals. Through persistence and determination, and after many phone calls, the information was finally obtained. Industry factors limit the extent of automating customer check-in procedures. Factors which limit the system to specific carriers include the interline agreement between carriers, their financial ability to implement the system, frequency of schedule service, and their load factors. Small carriers, with limited service and capacity, will not benefit from automated check-in procedures.

Review of Related Literature

Technology

J.D. Power and Associates advised airlines to be wary of cutting back on service, which factors highly in maintaining market share. For airlines to satisfy the service wants of the domestic business traveler, they must surpass the traveler's expectations of timeliness, convenience, and comfort in the flight. One way of doing this is through customer service automation (Ott, 1993).

Automation of systems and procedures have been going on for decades. By 1940 more real-world machines were running themselves. Included in this category were punch card tabulators and automated door openers. Machines now seem to be replacing the human brain (Time-Life, 1986). Electronic technology is still moving forward at an incredible pace. The single most important effect this is going to have is to reduce the cost of electronic aids for engineering designers. The Airlines increasing use of improved automation systems, such as bar-coding and forecasting systems to determine cargo capacity and load factors, also provide faster and more efficient service (Thuermer, 1992).

The implementation of an automated airline check-in system will use state-of-the-art technology. We need to move our technology more rapidly into the area of conscience where a designer knows what an idea can do, where its limitations are, and has all the necessary design data (Rouse, & Boff, 1987). A successful design must be responsive to a client's needs and requirements.

A fundamental change in an organization's technological infrastructure wields the power of the hand at the turning rim. It increases its competitive advantage, and can contribute to the differentiation of the carrier introducing the new technology early. Technological change defines the horizon of our material world as it shapes the limiting conditions of what is possible and what is barely imaginable. It erodes taken-for-granted assumptions about the nature of our reality, the "pattern" in which we dwell, and lays open new choices (Zuboff, 1988).

Bruce Ressler, of Meridian Automation and Technology, believes that automation is helpful if it is deployed in areas where customer service people are assisting customers in a more personal way (Arend, 1992). Mary Powers, of Investment Operations Advisors, pointed out that technology is necessary to be competitive, but the human element still plays a crucial role in dealing with customers. Growing ranks of business marketers unwittingly sacrifice customer satisfaction for modern efficiencies (Donath, 1992). Airlines, like marketers, should not avoid customer service automation. Instead, automation has to support customer service personnel and should not be used to supplement them (Donath, 1992).

Effectively integrating technology into the workplace, via the concept of job redesign, may be essential for the 1990s. Rethinking and restructuring individual functions may be the key to maximizing computer technology's potential, by freeing people from the mundane and facilitating a wider variety of tasks for everyone. However, job redesign is never easy because it challenges conventional assumptions about authority and power (Iadipaolo, 1992).

Information. Fundamental to the proper use of information and communications, relative to ticketing and pricing, technology is an initial conception of the scale and scope of the system. It would seem necessary, when first planning the application of the new technology, to conceive the system as the full complex of connecting airlines servicing the public. Treating this as what must be subjected to integrated control, there is little justification for the duplication, cost, and loss of control resulting from separate systems for the handling of passengers by individual airlines.

Airlines compete for passengers by using different strategies. To compete for the business traveler, airlines differentiate their product based on service and flight schedule. When competing for the leisure traveler they do so based on fares and free amenities. It is in the airlines best interest, since there is now little or no product differentiation between airlines, to have a homogeneous system that is integrated to all carriers and accessible to users.

It is possible to consider informating- activities, events, and objectives are translated into, and made visible, by information when a technology informates as well as automates- objectives at the start of an automation process. When this occurs, the choices made with respect to how and what to automate are guided by criteria that reflect developmental goals associated with using the technology's unique informating power (Zuboff, 1988).

Automation. The word automatic comes from the Greek word for "self-acting". The word automation, coined in the 1940s, today means a system, process, or piece of equipment that is self-acting and self-regulating. With the vast array of automation tools available today, change in business procedures is inevitable. Three important factors must be included in all business system plans:

1. Pay close attention to the marketplace.

2. Use available automation tools to the best advantage.

3. Have good people. Automation should be used to increase productivity, efficiency and customer service through restructuring of business processes (Peterson, 1994).

Companies are slowly recognizing that their competitive advantage lies not in their ability to control the use of automation, but in their opportunity to influence the expansion of its power. Automation must be an integral part of any firm's plan to bolster sales, create marketing programs, increase efficiency, or decrease expenses (Muloahy, 1992). Automation has frequently been used to replace the human in tasks that are monotonous, as in the case of airline employees, physically tiring, dangerous, or harmful

to health (Rouse & Boff, 1987). Automation will open new opportunities for more effective performance of the decision implementation functions that often are scanted or handled within an unduly narrow context (Rouse & Boff, 1987).

Automation will play a crucial role in determining whether we can, in the future, maintain the high standard of living we now enjoy. This standard of living, which is based on our productive achievements, is one of the sources of our freedom ("The New Technology: Information", 256). In its capacity as an automating technology, information has a vast potential to displace the human presence (Zuboff, 1988).

Automation is one way in which air carriers including all passenger, combination of passenger and freight, and freighters can provide a value added service (Bowman, 1992). Automation will not have dramatic or revolutionary impacts on the operations and decision-making processes of the organization. Instead it will reinforce existing structures. Automation is a political resource in the bureaucratic politics of organizations. It affects the interest of people both inside and outside of the organization. American Airlines and United Airlines are among the carriers developing products that are designed to increase efficiency by automating repetitious and high-volume tasks (Feldman, 1992).

Automation should be implemented through a series of carefully thought-out stages. In the first stage, preparation, a project team should be formed. In the second stage, management's approval should be gained for the proposed automation system. This ensures that the project will satisfy its users' requirements. Stage 3 accomplishes this through a 5-step process called Sales and Marketing Automation Needs Audit

(SAMANA). Based on the results of stage 3, stage 4 will likely include:

1. Designing a pilot system based on the company's specific needs

2. Establishing quantifiable measurements for assessing the benefits of the pilot system, and

3. Reviewing the pilot system results against the quantifiable measurements (Goldenberg, 1992).

Economic considerations. The potential benefits from a new technology are far-ranging. The most obvious one is reducing the direct cost of labor and raw materials. Investment costs can be forbidding, practicularly for complex and expensive automation projects that require extensive facility overhaul (Krajewski & Ritzman, 1992). There is a direct relationship between the airline industry and the economy. When the economic downturn of the eighties began, airlines began to go bust, particularly in the US (Kjelgaard, 1992). Already weakened by the fare wars that had followed deregulation of the airline industry in 1978, big carriers began to experience substantial losses of liquidity and cash flow. This in turn affected airline financing because it accounts for such a large part of the worldwide industry. At the peak of the 1980s boom. US carriers accounted for forty percent to fifty percent of all air-transport capacity and traffic (Kjelgaard, 1992).

The economic status of the world air-transport industry is worst than at any time during the forty-six year history of modern international civil aviation. In a report published in 1991, the International Air Transport Association (IATA) predicted that possibly only twenty member airlines are able to meet their operating costs, replace their assets, and finance their growth either from their own resources or from the financial

markets in normal commercial terms. The situation has worsened since publication of that report. To be more efficient, airlines are using automation to reduce costs, and automation of customer services can by used as a means of reducing costs.

If the program requires extensive design efforts, there are usually several influencing factors besides politics affecting its development. They include money, time, and management's acceptance of results (Time-Life, 1986). In considering economic factors in technological innovation, including automation, a distinction should be made between the development of technology and its adoption. The factors influencing development differ in part from those influencing introduction (Dunlop, 1962). The savings that result from energy and materials, efficiency, reduced labor force mis-allocated to dealing with routine tasks, and higher productivity must be balanced against the capital cost of the equipment and more expensive maintenance (Rouse & Boff, 1987). From an economic point of view, it is sound policy to assist workers in their process of re-adjustment to technological change. Nor can we overlook the social implications (Dunlop, 1962).

Social implications. For some workers the transition to a new kind of job is feasible, but for others the process may be painful, demoralizing, and seemingly beyond their individual capabilities. Changing technology means new industries and new kinds of jobs which may require skills other than those of the past (Dunlop, 1962). Businesses have been evidencing a growing social awareness of their employees. Many airlines now provide educational opportunities, both in-house and external, for employees. Recognizing that business has social obligations over and beyond the private

concern of conducting an enterprise at a profit will help lessen the tension of changing operating systems, and philosophies, relative to the introduction of an automated customer service system. It is an awareness or an obligation to be concerned about, and to participate in solving, the human problems of society as a whole created by advancing technology ("The New Technology: Information", 256).

One of the major reasons why companies have not achieved good performance from computing, and have experienced problems with it, is that most managers shy away from computing, preferring to leave the management of this critical resource to some one else -usually the data processing manager- (Kraemer, Dutton, and Northrop, 1981).

Productivity. According to the Labor Department, the airline's rate of productivity, or output was near the bottom of the 120 industries tracked (Velocci, 1993). Whether airlines are financially stable as they enter the twenty-first century depend largely upon what fundamental business changes they make in the next few years. Without such changes, sustained profitability may be difficult or impossible to achieve (Phillips, 1994). Productivity and labor costs together are perhaps the most pressing issue facing the large multi-service airlines. Labor costs were about thirty-five percent of the total 1992 operating expenses of American Airlines, Delta Air Lines, United Airlines and USAir- the big four (Velocci, 1993). Unless airlines take strong measures to restructure, they will be hard pressed to rebuff predicted financial losses (Phillips, 1994).

Many companies, including airlines, are implementing some product or service to increase productivity or to lower costs. An increase in productivity commonly occurs when an existing facility is automated or when a completely new facility, which includes

automation, is compared with a facility using a traditional technology (Rouse & Boff, 1987). Automation will reduce the amount of administrative discretion in handling tickets by better accounting for every transaction (Kraemer, Dutton and Northrop, 1981).

In an attempt to save floor space and improve worker productivity, Air Canada has installed two automatic storage and retrieval systems (AS/RS) in its maintenance base in Montreal. The system will provide a rapid 3.5 year investment payback (Rees, 1994). Employees should be made aware of the advantages of automation in terms of strengthening the airline's competitive position, insuring a more efficient and productive working environment, and improving overall operations. Job enhancement should be stressed.

Labor relations. Fifteen years after deregulation, labor relations in the airline industry returned to the status quo ante as union power, particularly the Air Line Pilots Association (ALPA), still dominates. Without a long-term shift in bargaining power between the parties, costs and productivity have not changed much (Dooley, 1994). A 1992 study performed for the US Department of Transportation suggests that while experts argue for the need to develop high-performance work systems that eliminate the differences between management and workers, the airline industry has moved towards greater and more dangerous conflicts (Feldman, 1993). Airlines have traditionally relied on aircraft technology for productivity increases, which masked high pay. When technological advances slowed in the 1980s, at the same time as deregulation, companies were forced to deal with the consequences of cost escalation (Feldman, 1993).

Labor-management relations take on a new look with respect to the new kinds of talents needed by business, new standards of productivity, and employee expectations. One of the biggest strains in labor-management relations is caused by the ongoing myth that automation is supposed to replace labor. When implementing an automated system careful consideration has to be given to educating employees on the feasibility of automating customer relations. A carrier has to be prepared to defend it planned program against mis-guided information.

Automation is meant to increase the productivity of people, not eliminate them (Weimer, 1992). Automation of the airline customer services procedures will not cause large-scale unemployment. The effects of automation would not be instant, there would always be sufficient "elbowroom" for procedural adjustments, employee conditioning, retraining, new placement and the like ("The New Technology: Information", 1990).

During the development of the automated teller machine (ATM) many observers predicted that their use would result in widespread displacement of tellers. This displacement has not occurred (Solomon, 1986). Automation does not change the job function, or redefined the job content, it enhances it. There is no reason to anticipate significant innovations in the existing structure of the airline's hierarchy.

Managements' role. Managing technology means more than choosing the right one: It also means implementing the technology and supporting it throughout the project startup (Krajewski & Ritzman, 1992). Management's task is to direct the use of resources, physical, financial, and personnel in order to achieve defined objectives. In private business, including airlines, the target is profit (Dunlop, 1962). Managers must

take the trouble to understand what the new technologies make possible, and what is necessary to implement their use both effectively and imaginatively. Only in this way will it be able to provide for computer-organization leadership of requisite competence and to accord it commensurate status (Heyel, 1972).

As airline managers seek competitive ways to expand market share and control costs, without sacrificing service, more of them are turning to computer programs and simulations designed to streamline the management of information and make the best use of available equipment and crews (Bremer, 1992). Airline managers are intensifying their quest for improved efficiencies by turning to applications of new technology to curb rising costs. To speed up processing time, magnetic strips on airline tickets are being used to process passengers more quickly (Ott, 1992). The greatest role on management of computing and other organizational technologies revolves around the chief executives and the top managers within the various user departments and agencies (Kraemer, et al., 1981).

Traditionally, airlines have tried to ensure customer satisfaction at the airport by throwing people at the problem. Recent developments in automation technology, however, are enabling greater accuracy by ensuring that not just people, but the right people in the right numbers, are in the right place at the right time. A completely automated customer service system will add to the improvement of airport operations (Gish, 1989).

Proponents of reengineering argue that, along with installing the appropriate technology, management should empower the customer service representatives with total responsibility for making sure the customer is served (Thomas, 1993). The manager's role is to facilitate a smooth transition to an automated system. Managers have the ability and authority to place the most talented personnel at the forefront of introducing the new technology. They should take a more advanced approach toward technological development, adopt a human-relations strategy toward socio-technological design, and create a professional administrative context for implementation of automation operations. In other service oriented industries there are certain trends that are unfolding that can be adapted to the aviation industry.

Social trends. For the individual passenger, US domestic air travel is limited to a number of options namely, a passenger with a ticket, with or without a boarding pass, and carry on luggage only can go directly to the gate and check-in with an agent. While passengers with luggage proceed to the main terminal departure hall. In Europe the situation is much different. Travelers with only carry-on luggage have long been accustomed to automated remote check-in possibilities.

This is currently being implemented at European airports where it is going a step further by providing remote facilities for passengers traveling with more luggage (McWhirter, 1994). At Amsterdam Schiphol, for example, Dutch airline KLM provides no fewer than seven options for departing passengers: through check-in, round-trip check-in, telephone check-in, fax check-in, ticket office check-in, gate check-in, and parking lot check-in. The airline actually encourages its passengers to check-in at

off-airport facilities. Check-in service in long-term parking lots include divesting yourself of your luggage as well as receiving your boarding passes (McWhirter, 1994).

For the un-ticketed passenger, with only carry-on luggage, remote check-in can be as simple as finding the nearest travel agent who can issue boarding passes. Airlines operate city ticket offices (CTOs) which can provide a full line of travel related services. Most airlines do not require reconfirmation before departure. Travelers who booked too early to get boarding passes and seat assignments, generally 21 to 30 days prior to departure, can call in for a seat assignment (McWhirter, 1994).

When it comes to luggage check-in, the Europeans are more creative. A popular option is checking in, with luggage, at a downtown hotel or terminal, which frees that passenger of luggage so they can go about their day's business unencumbered. Other options available at many European facilities include downtown luggage check-in, car rental check-in, and rail check-in facilities. Luggage check-in options are considerably more limited in the US, although domestic luggage check-in causes few problems because of the widespread availability of curbside check-in at virtually every major airport, and many smaller ones.

Although the current system is straight forward, airlines are working to upgrade the product. USAir is instituting new ground handling procedures that include hand-held check-in computers which will enable an agent to check-in a passenger at virtually any point in the airport (McWhirter, 1992). Delta is looking into curbside touch-screen technology, where you check yourself in. That is check your bag, obtain a seat assignment and boarding pass, and then go straight to the gate.

Role of the automatic teller machine (ATM). The cashless society in which we function is made possible by already available computer-communication systems. A major requisite of the system envisioned is the prevention of losses through error and fraud (Heyel, 1972). The introduction of an automated passenger services system can be likened to that experienced by the banking industry with the introduction of the ATMs. In the 1980s electronic money and credit transactions changed the ground rules and earnings streams of businesses and individuals-and in the process opened new opportunities. New technology, first applied in a given business as a convenience, proliferates into extensions and collateral activities far beyond the scope of the original applications. The car replacing the horse and carriage is a good example of this (Heyel, 1972).

With automation, the airline industry is today where the banking industry was in the early 1970s with its ATMs. People were unfamiliar with computerization and no one used them. Now people understand them and appreciate their convenience. Eventually this will happen with an Automated Ticket and Boarding (ATB) system (Lyon, 1990).

The development of portable data terminals and ATBs will lead to a new rash of options becoming available to passengers and airlines alike. ATBs allow passengers to check-in by self-service machines which prints luggage tags in addition to assigning seats. The system is currently being used by Lufthansa and Air France. The only drawback to the widespread use of ATBs is the high cost of installing the necessary ATB printers at travel agencies and other remote places. This system is limited to large, Part 121, carriers that can afford the technology.

Benefits of automation. An ATB pass will enable airports to squeeze the maximum capacity out of limited terminal space. With airport terminals bursting at the seams, this airline innovation is being welcomed enthusiastically by airport managers. Passengers will be able to check-in more quickly, cutting queues ("A Passport to Easing", 256). The full automation of airline passenger customer services procedures will mean that airlines will have greater control over its marketing initiatives and will be able to keep track of passengers as they go through the airport, including concessions and other services.

An automated system will help increase the on-time departures of flights by reducing the number of passenger transactions at check-in counters (Henderson, 1993b). Airlines will have to embark on a public education program to familiarize users with the new system. When a passenger with checked baggage does not check for a flight at the gate his bags will not be loaded. This acts both as a security measure and as a service to passengers. ATBs can be used to reduce ticket fraud, estimated to cost each airline about $15 million annually (Lyon, 1989).

The introduction of magnetics will prevent adults from flying with a child's ticket, for example, an agent from giving or discounting coupons to a friend or upgrading without charge. It will curtail use of stolen tickets, also estimated to cost each airline $4.5 million annually (Lyon, 1989). Like an ATM, placing a ATB system on corporate premises can reduce the risks and costs associated with replacing lost or stolen tickets, improve relations between the travel department and other departments, and allow for immediate access to make travel arrangements (Lyons, 1989).

System implementation strategies. There are two strategies to the technological development of tickets and baggage processing, the advanced technology strategy and the conservative approach. The advanced strategy is advocated by reformers who advise to automate early, develop a large number of applications, encourage high levels of computer use, develop the capacity to generate reports, and accept the attendant high levels of technological instability (Kraemer, et al., 1982). Advocates of advanced technology argue that automation should be done early and extensively, develop a level of computing sophistication, and accept the costs of technological instability which accomplish advanced developments (Kraemer, et al., 1981).

The conservative approach strategy suggests holding back on automation until there is a clear and demonstrated need, concentrating resources by developing a small number of applications, focusing on quality rather than quantity, and holding development to a rate consistent with maintaining enough in the technology to avoid the inefficiencies involved in continually learning new systems and procedures (Kraemer, et al., 1981). Formal automation leads to greater work pressures which may be a major reason behind their automation because automation of the airline customer service procedures might decrease time pressures on customer service representatives, it should thereby have positive effects on the job satisfaction of employees (Kraemer, 1981).

Selected approach. The routinization of automated applications is often important to the performance of computing. The longer an application has been around, the more likely it is to have the "bugs" worked out of it and to be commonly used (Kraemer, et al., 1981). That is to say, automate rapidly. Given that technological development is

associated with improved performance, rapid development is likely to be more effective than the conservative "go slow" approach.

The automation of a large proportion of operations involves the information processing task. Automation of only small segments may create bottlenecks in manual operations. The comprehensiveness of automation within a task is important to achieving the full benefits. The airline customer service system will be a sophisticated application with on-line processing capabilities. Passengers will have easy access to all travel related information from carriers. On-line processing provides easier access to more up-to-date information and improved performance for nearly every kind of information-processing task involved in the transaction between passenger and airline (Kraemer, et al, 1981).

Security. Existing computer systems can provide a high degree of protection against technological and human failure through built-in controls and redundancy (Heyel, 1972). To maintain privacy of the user and to prevent fraud, in order for consumers and business users to authorize an automated passenger system to furnish credit authorization, they will have to identify themselves by the card they carry. These cards will open, with the assistance of a personal identification code, the holders account for action after insertion in the terminal device (Heyel, 1972). Other services and safeguards will be built into the system. For example a payment arrangement plan can be implemented for corporate users of the services.

For international, travel airlines cannot offer curbside luggage check-in. International travel involves the inspection and validation of travel related documents, including passports and other forms of identification. There are also restrictions in domestic travel. For security reasons, airlines do not allow passengers to travel separately from baggage. The threat of terrorism and other more recent world issues have largely resulted in streamlined security measures.

Ticketing. Self-service ticketing is gaining interest among carriers in the airline industry. In the past American Airlines and United Airlines installed remote ticket machines, but the system failed to be viable. All Nippon airline makes extensive use of self-service machines in Japan; British Airways has begun using Datamax machines in its shuttle out of London; SAS is testing Nixdorf machines on its intra-Scandinavian service, and Southwest Airlines is a big user of self-ticketing and terminal services (Henderson, 1993a).

Examples of automation. In 1992 the Virginia Railroad Express (VRE) successfully introduced an automated system designed to provide riders with consistent and dependable service. VRE has an innovative proof-of-payment system in which fares are collected by automated ticket vending machines. The system has demonstrated remarkable efficiency (Vantuono, 1993). Singapore Airlines is using a computer-based system to speed passenger check-in and boarding. The DCS90 network is easy to use, allowing agents to expedite the check-in process (Ott, 1992).

A new airline maintenance automation system that offers integration and extensive capabilities is Airman. Airman was developed by Cambridge Online. It controls production in terms of costs, work in progress, and other labor utilization. It is currently being used by American Eagle (Henderson, 1992). Denver International Airport (DIA) is perhaps the most well known example of airport automation to date. DIA's automated baggage system is an ultracomplex, twenty-mile-long, $193 million, fully automated baggage system, designed and built by BAE Automated Systems of Dallas. The system, to date, remains recalcitrant (Henderson, 1994). The German consulting firm Logplan recommended a low-technology, reliable backup for the automated, car-based baggage handling system. The backup plan involves conveying the luggage from check-in to a sortation area; after being sorted mechanically, the luggage is loaded onto carts that are towed to the gates (Knill, 1994).

United plans to unveil optional electronic ticketless travel for users of its Shuttle. Travelers will receive a confirmation number at time of booking and receive their boarding pass at the airport at a check-in desk, gate, or via automated ticketing machines the airline will install (1994, Staff).

Federal Express is counting on computerization to lower costs and boost growth. It is automating as many aircraft-handling tasks as possible, including air sequencing, ramp movements, rerouting planes and shipments when an aircraft has a mechanical problem, and maintenance. Automation will be applied to truck movements eventually (Feldman, 1994).

With its acquisition of the MachUp flight scheduling system from the Lightstone Group, American Airlines Decision Technologies is making capabilities available to its customers that range from simple automation of manual scheduling tasks to sophisticated solutions incorporating everything from profitability models to management of airport slots (Henderson, 1994).

As airports become more and more crowded and airline scheduling become complex, moving people around an airline terminal efficiently has become almost as important as scheduling flights. Officials at major airports are turning to automated people movers (APMs) to make it all work. APMs are automated, driverless vehicles that operate on a fixed guideway through an exclusive right-of-way. It is being used at DIA. Planners and operators of almost all major airports envision the implementation of an APM system at some point (Austin, 1993).

Airlines worldwide are reassessing their food-service operations, flight catering in general, as integrated factors in stringent cost reduction and restructuring moves. Advanced technology and automation of food production procedures are catering industry buzzwords. Scandinavian Air System's (SAS) Service Partner opened its visionary 'Flight Kitchen of the 21st Century' (Hill, 1993).

After years of fare wars aimed at improving market share rather than profit, the major airlines are working on automated programs that should make pricing decisions more rational and boost revenue. Once implemented, the system will provide more relevant, up-to-date information and make analyzing the data easier. The airlines will have no choice but to price more profitably (Feldman, 1994).

Summary. The literature review supports the need to automate the passenger service sector of the domestic airline industry. In 1990 domestic enplanements stood at 456 million and this is expected to exceed 935 million by the year 2005, placing added demands on an already strained system (FAA, 1990). There are ongoing efforts within the aviation and aerospace industry to improve, using automation as a tool, various systems ranging from ATC, aircraft, baggage handling, catering, and cargo operations. Already in Europe there is widespread use of alternative options available to passengers. These systems, once adapted to US standards, can be implemented in the United States. An automated system will improve the efficiency of customer relations and facilitate efficient utilization of personnel. For airlines to satisfy the service needs and wants of the traveling public, they must surpass the traveler's expectations of timeliness, convenience and comfort. One way of doing this is through customer service automation.

The review of related literature suggests that the industry will suffer very little loss of personnel as a result of an automated system. Automation may be helpful if it is deployed in areas where customer service personnel are assisting customers in a more personal way. There may be improved customer services where the right people will be deployed, in a effective and efficient manner, at the right places and times. With any new technology there is always a need to create and operate support systems. Customer service personnel can be trained to manage these support systems. There is existing technology that can be easily networked to implement the automated ticketing and baggage system. There are various vendors that can readily provide such systems.

For an airline, automation can be used as a means to gain competitive advantage. Automation should be used to support customer service personnel and should not be used to supplement them. Automation is a political tool that should be used to reinforce the existing structure of an airline. It affects the interest of people both inside and outside of the airline. Automation will play a crucial role in determining whether we can maintain the high standard of living we now enjoy.

Statement of the Hypothesis

There is an increasing use of automation associated with customer services in other customer oriented industries. In the aviation industry nearly all aspects associated with travel are either partially or fully automated. Technology is being used to reshape the aviation industry. The annual growth of domestic enplanements is 4.8 percent. However, this growth is not being met by an increase in airside facilities and as a result is contributing to land side congestion at major airports. This research hypothesis is being conducted to determine whether airline station managers and supervisors believe that an automated passenger check-in system will improve the effectiveness and efficiency of customer related services, maximizing the allocation of human resources to better serve the needs of the traveling public.

METHOD

Sample

Fifty-five station managers and supervisors were the participants in this research. The research was limited to airports with multiple, daily, jet service. The study was limited to Florida for several reasons. First, there are several major airports in cities that serve as major tourist attractions. Second, MIA and MCO are among the top thirty airports in the US. Finally, airports including FLL, MIA, MCO, JAX, and TPA, are the largest passenger used facilities in the state.

Instrument

This research employed a questionnaire, developed for this study, for collecting data. Airline managers and supervisors, along with their employees, come into contact with the traveling public and are familiar with their needs and expectation. The instrument examined the importance that managers and supervisors place on passenger interaction and their expectations from the airline with respect to the check-in process. The instrument also examined the importance of security and safety issues associated with air travel. In addition, the survey was used to determine, from the managers and supervisors perspective, what passengers expect from an automated check-in system.

Because a questionnaire was used, there was the possibility that the questions being asked could have been misinterpreted by the respondents. To avoid complications associated with question misinterpretation, a pilot study was conducted. For the pilot study ten managers from various airports along the Eastern Seaboard were randomly selected from a listing of airlines station managers in the World Aviation Directory.

Locations included Boston (BOS), Massachusetts; Pittsburgh (PIT), Pennsylvania; Newark (EWR) New Jersey; and John F. Kennedy (JFK), New York. The pilot study was conducted to ensure that the sample population would not have had difficulty understanding or answering the questions.

The pilot questionnaire contained twenty questions categorized into demographics, user interface with computers, and respondents attitude toward airport check-in procedures. Once the pilot study was returned, little revision of the questionnaire was required. Question one was asked to determine the general demographic profile of respondents. To be politically correct the term "sex" was changed to "gender", and the age category was broadened to maintain the anonymity of respondents.

Question two of the questionnaire was concerned with the subjects familiarity and use of advanced computer applications. The applications were carefully selected to determine whether respondents regularly used advanced, interactive, technology. This question required no changes from its original format.

Question three asked respondents to indicate, by circling "yes" or "no", whether it is necessary for passengers to interact with airline employees. This question did not need to be reworded. Question four was concerned with the time spent interacting with the traveling public. The question was asked simply to determine whether managers and supervisors themselves interact with the traveling public. Again, there was no need to change the original format of this question.

Questions five through ten employed a five point scale. The five point scale, ranging from one through five, was arranged in ascending order of importance. On the scale, one was labeled less important and five was labeled most important. This portion of the questionnaire was used to determine the attitudes of managers and supervisors for their concerns with the safety and security of using an automated check-in system. No one in the pilot study expressed difficulty interpreting the meaning of the statements. There were minor rewording changes, however.

Question 11 asked respondents to indicate, by choosing "yes" or "no", whether there is a need to automate the current manual system of customer check-in procedures. This question remained unchanged for the study. Questions 12 through 16 asked respondents to rate the importance of items pertaining to the benefits of automation. These questions also used a five point scale and except for minor rewording the questions remained unchanged.

Questions 17 through 20 were mutually exclusive to one another. Question 17 asked respondents to rank, in order of importance on a seven point scale, why an automated check-in system should not be considered as an option to the current check-in procedures. The seven point scale ranged from seven to one in descending order of importance. Questions 18 through 20 dealt with the location of the automated system; the traveling public's attitude toward the automated system; and the manner in which the system should be introduced. Respondents did not indicate any difficulties in understanding the nature of the questions.

There was a fifty percent return rate on the pilot study. Once the questionnaire's structure and interpretability were proven and minor changes made, it was mailed to managers and supervisors of major airlines at the larger facilities in Florida. A validation expert, Dr. Henry Lehrer, assisted in verifying the integrity of the questions that were asked on the survey. At no time were respondents names use in the analysis or inference. This fact was made clear in the cover letter that accompanied the questionnaire. Because the survey employed a questionnaire, and not an interview, there was no need to pretest, train interviewers, or to quantify for an interview. Examples of the pilot study questionnaire and accompanying pilot cover letter can be found in appendices A and D, pages 68 and 74 respectively. Examples of the study questionnaire and accompanying cover letter can be found in appendices A and C, pages 64 and 72 respectively.

Design

The descriptive method of research was used for this study. This method, which is described by Gay (1992), uses questionnaires, opinionnaires, or interviews as instruments to collect data that are used to test a hypothesis concerning the attitudes of individuals in the study. This method was chosen because this study was concerned with collecting data to determine the opinions of airline managers and supervisors toward the possible automation of passenger check-in procedures. A survey, like any other self-report, is affected by uncontrolled variables. Of major concern is the return rate of respondents to the questionnaire.

The research hypothesis tried to determine the attitudes of airline station managers and supervisors with respect to the automation of passenger check-in procedures. Airline managers and supervisors are fully aware of the needs and expectations of their respective airlines and the traveling public. Their opinion, as experts, were used as a measure to determine the attitudes of the population.

Procedure

The instrument used for this study consisted of a self-developed questionnaire. Because the instrument has not been used previously, it was necessary to conduct a pilot study to ensure that the survey collected the desired data. A pilot study provides the opportunity for finding errors before a questionnaire is sent to a sample population being surveyed. The pilot study was sent out on May 8, 1995, with a return deadline of May 26, 1995. Respondents were asked to critique the questionnaire for clarity by writing comments and suggestions. There was no need for any type of sampling selection.

There are limited numbers of station managers and supervisors at the selected airports. Of the ten surveys that went out fifty percent were returned. Those who responded to the questionnaire made very few comments. Based on the manner in which respondents replied to certain questions, some rewording was subsequently made to the questionnaire. The final draft of the questionnaire was approved by the chair and mailed to the sample population on June 12, 1995. Respondents were instructed to reply by a deadline that was approximately two weeks after receipt of the questionnaire. This was done in an attempt to obtain an high return rate and improve the data collection time.

RESULTS

The fifty-five questionnaires were mailed to the sample population on June 12, 1995 and respondents were asked to return them by June 30, 1995. It was expected that a percentage of respondents would not complete the questionnaires. By the deadline date, June 30, 1995, fifty-sic percent of the questionnaires were received. A reminder letter, requesting respondents to complete the survey, was sent to the entire sample population, and by August 1, 1995 six additional responses were received. The thirty-seven surveys, representing 67.3% return rate, were then analyzed.

A non parametric test, employing Chi-Square (X^2), was used to determine whether there was a significant difference in the responses between managers and supervisors. Eighteen supervisors and seventeen managers responded to the questionnaire. A test of difference could not have been performed between males and females because there were nine female respondents versus twenty-seven male respondents. Because the results showed that in all instances the calculated X^2 was significantly different than the table X^2 at the alpha level of .05, and at the respective degrees of freedom (*df*), it was concluded that there were no significant differences in the manner in which managers and supervisors responded to the survey. The results of the X^2 test of variance is shown in Appendix E.

Question 1

Question one was asked in order to obtain demographic information on the sample population. Table 1 shows the summary for the responses to question one.

Table 1

Demographic Data of Respondents

Response	N	%
Gender:		
Male	27	73
Female	9	24
Age:		
Under 25	0	0
26-35	6	16
36-45	16	43
Over 45	15	41

Of the 37 respondents to the questionnaire 73% were male and 24% female. One respondent did not indicate gender on the questionnaire. None of the respondents were under 25 years. Sixteen percent of the respondents were between 26-35 (43%). The majority of respondents, 43%, indicated that they were between 36-45. 41 percent indicated that they were 45 years old or older.

Question one also asked respondents to indicate their highest level of educational accomplishments. The results of this part of question one are shown in Table 2.

Table 2

Highest Education Level of Respondents

Response	N	%
Bachelors Degree	16	43
High School	12	32
Associates Degree	6	16
Masters Degree	2	5
Doctorate	0	0

From the returns received, 32% of those who responded indicated that they had a High School Diploma. 16 percent of the respondents had an associates degree. Forty-three percent, the majority of respondents, has a Baccalaureate. Five percent of those who responded indicated that they had a Masters Degree. There were no doctorates. One respondent did not respond to this question.

Question one also asked respondents to indicate their current job position. Table 3 shows the results of current job title, as indicated by respondents.

Table 3

Current Job Position.

Response	N	%
Supervisors	18	49
Manager	17	46

Of the responses received, 46 percent of the respondents were managers and 49% supervisors. Two respondents did not indicate their job title on the survey.

Question 2

Question 2 focused on the use and familiarization of consumer oriented, advanced technology. Multiple responses were given for this question. Table 4 shows the responses to question 2.

Table 4

Technology and Technological Applications

Response	Frequency	%
Fax Machine	32	86
PC Computer	27	73
E-mail	22	59
America Online	8	22
CompuServe	3	8

Several respondents did not answer this questions and, in some instances, indicated that they did not use any form of technology provided in the survey. Eighty-six percent of the respondents indicated that they use a Fax Machine. Of the respondents, who answered this question 73% indicated that they use a personal computer (PC). Fifty-nine percent indicated that they use E-MAIL. Twenty-two percent of the respondents use America Online. Eight percent of those who responded use CompuServe.

Question 3

This was the first of the questions to addressed the interaction between passengers and airline employees. The results to this question are shown in Table 5.

Table 5

Necessity of Interacting With Airline Personnel

Response	N	%
Yes	36	97
No	1	3

There was a 100 % respond rate for this question. Ninety-seven percent of the respondents indicated that it is necessary for passengers to interact with airport customer service personnel. Three percent of the respondents indicated that is not necessary for passengers to interact with airline employees.

Question 4

This question asked respondents to indicate the total time spent interacting with passengers on a daily basis. The question was asked to determine whether respondents spent time interacting with passengers. Table 6 shows the summary of responses to Question 4.

Table 6

Percentage of Time Spend Interacting With the Travelling Public

Response	N	%
Continuous	21	57
Limited	9	24
Regularly	7	19

Fifty-seven percent of the sample population indicated that they spend greater than 35% of their day interacting with passengers. Twenty-four percent of those who responded indicated that their interaction with passengers is limited. They spend less than 20% of their day with passengers. Nineteen percent of the respondents indicated that they interact regularly with passengers. Both managers and supervisors spend between 20% and 35% of their day interacting with passengers.

Questions 5 through 10 asked respondents to agree or disagree with statements related to different aspects of customer services at the time of checking in. A five point scale was used which enabled respondents to indicate his or her choice on th scale.

Question 5

This question asked respondents to rank the importance of security and safety of a passenger's checked baggage. Table 7 shows the responses to this question.

Table 7

Security and Safety of Baggage

Response	N	%
Strongly Agreed	29	78
Agreed	5	14
Undecided	2	5
Disagreed	1	3
Strongly Disagreed	0	0

The majority of respondents, 78% of those who responded, strongly agreed that the safety and security of baggage is very important when planning the automation of passenger check-in procedures at airports. Fourteen percent of the responses agreed that the security and safety of baggage is important. Five percent were undecided as to whether or not security and safety of baggage is important or not. Three percent of the respondents disagreed with the statement. They indicated that the security and safety of baggage is not an important issue when considering the automation of customer service check-in procedures.

Question 6

This question addressed the importance of verifying flight related documents. For domestic travel within the United States, a fare paying passenger needs only a ticket and a boarding pass. Table 8 shows the responses to the verification of flight related documents.

Table 8

Verification of Flight Related Documents

Response	N	%
Strongly Agreed	22	59
Agree	8	22
Undecided	6	16
Disagreed	1	3
Strongly Disagreed	0	0

Fifty-nine percent of those who responded to the survey strongly agreed that it is very important to consider the verification of flight related documents when planning the automation of airport check-in procedures. Of the respondents 22% agreed that the verification of flight related documents was important to them. Sixteen percent of the respondents were undecided as to the importance of the verification of flight related documents, while three percent disagreed that the verification of flight related documents was important when considering automating the process.

Question 7

This question asked respondents to rank the importance of public relations during airport check-in. The responses to this question are shown in Table 9.

Table 9

Response to Public Relations

Response	N	%
Strongly Agreed	22	59
Agreed	9	24
Undecided	5	14
Disagreed	1	3
Strongly disagreed	0	0

Most of the respondents, 59%, strongly agreed that public relation at the time of airport check-in is important. Twenty-four percent of the respondents agreed that public relations is important during the check-in process. Fourteen percent of those who responded to this question were undecided with the importance of public relations interaction that is conducted between passengers and airline employee.

Question 8

Question 8 asked respondents to rank the importance of passenger comfort and support. Table 10 shows the results obtained for this question.

Table 10

Passenger Comfort and Support

Response	N	%
Strongly Agreed	22	59
Agreed	12	32
Undecided	3	8
Disagreed	0	0
Strongly disagreed	0	0

The majority of respondents, 59% of the returns, agreed that passenger comfort and support is important with respect to the automation of passenger check-in procedures. Thirty-two percent of the respondents agreed with statement that passenger comfort and support is important when considering the automation of passenger check-in procedures. Eight percent were undecided as to their position with respect to statement.

Question 9

This question asked respondents to rank the importance of problem resolution during the passenger check-in process. Table 11 shows the results of problem resolution.

Table 11

Response to Problem Resolution

Response	N	%
Strongly Agreed	27	73
Agreed	10	27
Undecided	0	0
Agreed	0	0
Strongly Disagreed	0	0

Of the 37 respondents 73% strongly agreed that problem resolution is a very important issue to be considered when planning the introduction of an automated passenger check-in system. Twenty-seven percent of those who responded agreed that problem resolution was an important issue when considering the automation of airport check-in procedures.

Question 10

Question ten addressed the expectation of passengers to having airline personnel contact at the airport. Table 12 shows the results of this question.

Table 12

Passenger Expectation of Personnel Contact

Response	N	%
Strongly Agreed	21	57
Agreed	12	32
Undecided	4	11
Disagreed	0	0
Strongly Disagreed	0	0

Of the 37 respondents 57 percent strongly agreed that passenger expectation of personnel contact is important to the airport check-in process and should be considered when planning the automation if check-in procedures. Thirty-two percent of those who responded agreed that this issue was important to the check-in procedures and should be considered when planning the automation of passenger check-in procedures. Eleven percent of the respondents were undecided as to the importance of passenger expectation of having personnel contact.

Question 11

Question 11 asked respondents to indicate whether, in their opinion, the existing passenger check-in procedure should be automated. The responses to this question are shown in Table 13.

Table 13

Need to Automate Check-in Procedures

Response	N	%
Yes	29	78
No	8	22

In this sample population of airport customer service managers and supervisors, 78% of the respondents indicated that, in their opinion, a need exists for automating passenger service check-in procedures. Twenty-two percent of the respondents indicated that there is no need to automate airport check-in procedures.

Question 12

Question 12 addressed the importance of using an automated system as a means of saving time which automatically mean on-time departures. The responses to this question are shown in Table 14.

Table 14

Saves Time Through Automation

Response	N	%
Strongly Agreed	15	41
Agreed	15	41
Undecided	4	11
Disagreed	3	8
Strongly disagreed	0	0

An equal number of respondents, 41 percent of the responses received, agreed and strongly agreed that time will be saved as a result of automating the check-in procedures. Eleven percent of those who responded were undecided as to whether an automated system will save time, while eight percent of the sample population disagreed that the system will save time during the check-in process.

Question 13

In question 13 the sample population was asked to rank the efficiency of an automated check-in system. Results of this question are shown in Table 15.

Table 15

Check-in procedures Made More Efficient.

Response	N	%
Strongly Agreed	23	62
Agreed	9	24
Undecided	5	14
Disagreed	4	11
Strongly Disagreed	0	0

The majority of respondents, 62% of those who responded, strongly agreed that an automated system will improve the efficiency of the check-in procedures. 24 percent agreed with the statement that check-in services will be made more efficient as a result of automation. Fourteen percent of the sample population responded that they were undecided with the statement that check-in procedures will be made more efficient through automation.

Question 14

Respondents were asked to rank the importance of an automated system on reducing escalating labor costs. Table 16 shows the results of this question.

Table 16

Automation Will Reduce Escalating Labor Costs.

Response	N	%
Strongly Agreed	19	51
Agreed	9	32
Undecided	3	8
Disagreed	2	5
Strongly Disagreed	1	3

Fifty-one percent of the subjects strongly agreed with the statement that an automated system is most important to the reduction of labor costs. Thirty-two percent of those who responded agreed that an automated check-in system can reduce labor cost. Eight percent of the subjects were undecided as to whether an automated system can reduce labor costs. Five percent of the sample population who responded to the survey disagreed with the statement that an automated system can reduce labor costs. Three percent of the sample population strongly disagreed that an of an automated system can reduce escalating labor costs.

Question 15

This question was asked to determine whether respondents felt that there is a need to better utilize existing technology. The results of this question are shown in Table 17.

Table 17

Automation Will Enable the Greater Utilization of Technology.

Response	N	%
Strongly agreed	11	30
Agreed	13	35
Undecided	9	24
Disagreed	4	11
Strongly disagreed	0	0

Thirty percent of the respondents strongly agreed with the statement that automation will enable the greater utilization of technology. Thirty-five percent of the subjects agreed that existing technology should be used to implement the introduction of an automated system. Twenty-four percent of those who responded were undecided as to the importance of the greater utilization of technology with respect to check-in automation. Eleven percent of the subjects disagreed with this statement.

Question 16

Question 16 asked respondents to rank the competitive advantage gained as a result of having an automated check-in system. The responses to competitive advantage are shown in Table 18.

Table 18

Automation Will Allow for a Gain in Competitive Advantage Over Other Carriers

Response	N	%
Strongly Agreed	14	38
Agreed	14	38
Undecided	5	14
Disagreed	4	11
Strongly Disagreed	0	0

Thirty-eight percent of the respondents strongly agreed that automation will give the airline a competitive advantage over its rivals. In fact, an equal percentage of respondents agreed that automation will give a carrier a competitive advantage over its competition. Fourteen percent of the subjects were undecided with the statement that automation will facilitate competitive advantage over competing carriers. 11 percent of the respondents disagreed with the statement by indicating that the automation of check-in procedures will give a carrier a competitive advantage over its rivals.

Question 17

Question 17 was asked to determine why automation will not be feasible. On the scale from one to seven, one indicated the least important reason and seven the most important reason for not automating check-in procedures. Twenty-seven percent of the respondents did not answer this question. Table 19 shows the analysis of this question.

Table 19

Tally of Responses to Question 17a Through 17g.

	Least important				Most important		
Response	1	2	3	4	5	6	7
Need People	5	7	4	1	5	2	4
Have Someone	1	0	5	10	4	3	4
Problem Resolution	11	2	4	1	2	0	7
Public Image	0	5	4	6	6	5	1
Feels Threatened	2	2	2	2	7	2	10
Costly to Implement	4	2	2	2	7	8	2
Complicated	6	2	3	1	1	4	9

Overall, the responses of the respondents who answered this question showed that, in their opinion, automation would not be feasible because it eliminated the human interaction during the check-in process. Over 60 percent of the respondents ranked each item as 4 or higher.

Question 18

Question 18 dealt with the location of the automated check-in machines. Some respondents gave multiple responses. Table 20 shows the results obtained for this question.

Table 20

Location of an Automated Check-in System

Response	N	%
Designated	16	32
All points	16	32
Gates & curb side	10	20
City ticket office	4	8
Airport car rental	2	4
Remote, off airport	2	4

There were a total of 50 responses to this question. Of the 50 responses 32%, the majority of responses, indicated that the system should be placed either at designated points or at all points possible. The second highest response, representing 20% of the responses, indicated that the system should be placed at gates and curb sides.

Question 19

Question 19 addressed the matter of the traveling publics' opinion to an automated system. Table 21 shows the results of the traveling public's opinion towards an automated passenger check-in system.

Table 21

Passenger Opinion to Check-in Automation

Response	N	%
Impersonal and isolated	18	35
I like it	14	27
"Real people"	10	20
Do not Know	8	16
Do not care	1	2
Waste of time/money	0	0

The total responses received was 51. Thirty-five percent of the responses indicated that the traveling public will consider an automated passenger check-in system as 'being impersonal'. Twenty-seven percent of the respondents indicated that the traveling public will 'like' the convenience of the system. Ten percent of the respondents indicated that passengers will choose an airline where 'real people' will process them.

Question 20

The final question of the survey asked the respondent to indicate how best to introduce the check-in machines at selected airports. Respondents had four selections from which to choose. Table 22 shows the results obtained for question 20.

a. One airport at a time, over an extended period of time

b. One airport at a time, switching to the system all at once

c. All airports at the same time, over an extended period of time

d. All airports, switching to the system all at once

Table 22

Automated Check-in System Schedule of Introduction

Response	N	%
A	16	46
C	9	26
D	6	17
B	4	11

There were 35 responses to this question. Almost half of the respondents indicated that the system should be introduced one airport at a time, over an extended period. 26 percent of the respondents indicated that the system should be introduced at all airports over and extended period of time. Seventeen percent of the respondents indicated that the automated passenger check-in system should be introduced at all

airports, all at once. Finally, 11% of the respondents indicated that the system should be introduced at one airport at a time, all at once.

Summary. The survey data indicates that 97% of respondents said it is necessary to interact with passengers. Fifty percent of the respondents interact with passengers for more than 1/3 of their time on a daily basis. The data also indicates that managers and supervisors value the importance of security and safety of baggage, verification of flight related documents, public relations, passenger comfort and support, problem resolution, and passenger expectation of personnel contact. In all instances the majority of respondents agreed or strongly agreed with the statements. They indicated that these issue were either important or most important to them.

Managers and supervisors value the personnel contact with passengers, yet almost 80% of the sample population indicated that passenger check-in procedures should be automated. The busy business traveler, or the frequent traveler, will choose to use some form of automated check-in system if it is made available. In Europe such systems already exist and are being used successfully.

From the responses to questions 12 through 16, managers and supervisors value the benefits to be gained from having an automated passenger check-in system. Almost 80% of the respondents consistently agreed or strongly agreed that these issues are important when addressing the automation of passenger check-in procedures. Managers and supervisors indicated that they are concerned with employees associating the automated system with job security, the public's perception of such a system, and the cost of implementing an automated check-in system. Respondents felt that the system should be introduced at one airport at a time, over an extended period of time.

CONCLUSION

The purpose of this study was to determine the attitudes of airline managers and supervisors toward the automation of passenger check-in system. Automation is reshaping the aviation industry yet, for all practical purposes, passenger check-in procedures is not benefiting from automation. The average annual rate of enplanements for domestic airports is approximately 4.8%. This growth is not being met by an improvement, or increase, in land side concrete to alleviate the problem of congestion at major airports.

The literature review supports the belief that an automated passenger check-in system will improve the effectiveness and efficiency of customer related services associated with checking in for a domestic flight, while at the same time maximizing the allocation of human resources. In order to accept or reject the hypothesis of this study, it was necessary to review the data received from the sample population. The data obtained from the survey of airline station managers and supervisors indicate that they value, rather highly, the public's interaction associated with passenger check-in procedures and its associated security and safety issues. The sample population also value the benefits associated with the implementation of an automated passenger check-in system.

In summary, the results obtained from the sample population suggests that they will welcome an automated system that addresses the issues that they are concerned about. An automated system will enable an airline to have the right personnel, at the right places at the right time, to address passenger concerns and expectations. An automated system will be particularly effective during busy travel periods throughout the

day and early evening. Such a system should be introduced at larger airports where passengers will have the option to choose between an agent or an automated system when checking in for a flight.

Some respondents commented that the elderly will not be able to use the system and may have problems understanding its functions. It should be noted that customer service personnel will still be available to assist travelers who need special assistance. An automated system is not meant to eliminate the human interaction between passengers and airline employees. Automation should be used to streamline the effectiveness of human resources for any given time which would facilitate the effectiveness and efficiency of customer related services, better meet the needs of the traveling public, and aid in the alleviation of terminal congestion.

Most respondents either agreed or strongly agreed with the statements that airlines will benefit from the time saved, the added efficiency associated with having an automated system, the reduction of labor costs, the greater utilization of technology, and the competitive advantage gained as a result of having an automated system. Respondents indicated that the system should be placed either at all points possible or at designated places. From their perspective they indicated that, for the most part, the traveling public will either use or not use the system.

RECOMMENDATIONS

The scope of this study was limited to airline station managers and supervisors in the State of Florida. Florida was chosen because of the impact of MIA and MCO on the travel industry, the number of major airports, and the number of enplanements. The following recommendations are suggested to further examine the feasibility of automating customer service check-in.

1. Studies could be made which will examine other options that can be used to alleviate congestion during the hours of high airport usage.

2. A study could be conducted which will examine the United States as a whole using a stratified sample with data collected from major cities.

3. A study could also be conducted, on a national scale, using frequent fliers and business travelers. Since most travel is done by business travelers, many of whom are also frequent fliers, their input could be crucial to the determination of the necessity to automate, or not to automate, passenger check-in procedures. For the best results this type of survey can be done by placing questionnaires either at the check-in counters or on board flights.

A survey of this magnitude would require assistance from the customer services and marketing departments of carriers. This method would be an excellent way for airlines to determine whether passengers prefer to utilize an automated check-in system or continue to use the existing check-in counters at airports. It would be beneficial to learn more about the attitudes of other of managers, supervisors, and the traveling public.

References

A passport to easing congestion. (1990, June). Jane's Airport Review, pp. 34-35.

Arend, M. (1992). Technology: Ally or enemy of customer service? ABA Banking Journal, pp. 88-92.

Austin, T. (1993, September). Traveling in terminals. Civil Engineering, pp. 40 - 43.

Bowman, Robert, J. (1992, January, February). All clear on the horizon, World Trade, pp. 34-39.

Bremer, K. (1992, September). Providing flexibility during a period of change in the industry. Commuter Air International, pp. 49 - 53.

Donath, M. (May 28, 1992). Over automating the front lines. Marketing News, pp.11

Dooley, f. (1994, Spring). Deja vu for airline industry relations. Journal of Labor Research, pp. 169 - 190.

Dunlop, J. T. (Ed.). (1962). Automation and technological change, New York: Columbia University.

Feldman, J. (1992, May). Living beyond their means. Air Transport World, pp. 70 - 77.

Feldman, J. (1993, February). Employees as partners. Air Transport World, pp. 68 -70.

Feldman, J. (1994, September). The price of success. Air Transport World, pp. 46 - 50.

Feldman, J. (1994, October). Getting serious on pricing. Air Transport World, pp. 56 - 60.

Gay, L. R. (1992). Education research: Competencies for analysis and applications (4th. ed.). New York: Merrill.

Gish, J. (1991, November). Get the most out of ground crews using computer Scheduling. Airline Executive, pp. 42.

Golenberg, B. (1992, January). Automation: pointers on process. Sales & Marketing Management, pp. 71 - 73.

Graham, J. (1994, April). Customer service redefined: the game has changed again. American Salesman, pp. 3 - 7.

Henderson, D. K. (1992, March). Automation through integration. Air Transport World, pp. 105 - 106.

Henderson, D. K. (1993a, August). Getting `information, not just data'. Air Transport World, pp. 67 - 72.

Henderson, D. K. (1993b, August). Automation picks up speed. Air Transport World, pp. 67 - 72

Henderson, D. K. (1994, August). MachUp optimizes schedules. Air Transport World, pp. 85-86.

Henderson, D. K. (1994, September). It's in the bag (s). Air Transport World, pp. 54 - 58.

Heyel, C. (1972). John Diehold on management, Englewood Cliff. NJ:

Hill, L. (1993, May). Trimming fat from food costs. Air Transport World, pp. 96 - 98.

Iadipaolo, D. (1992, April). Job redesign - and justice for all. Insurance & Technology, pp. 50 - 51.

Knill, B. (1994, October). Baggage system: push comes to shove. Materials Handling Engineering, pp. 66 - 67.

Kjelgaard, C. (1992, October). Airline finance: fall from grace. Euromoney, pp. 86 - 92.

Kraemer, K. L., Dutton, W. H., & Northrop, A. (1981). The Management of Information Systems, New York: Columbia University.

Krajweski, L. J., Ritzman, L. P. (1993): Operations Management: strategy and analysis, New York:

Lyon, M. W. (1990, November). Computer system localizes customer service. Airline Executive, pp. 22.

Mann, P. (1993, March). FAA sees solid traffic growth. Aviation Week & Space Technology, pp. 27 - 28.

MacPherson, G. (1993). Automation is not the enemy. Catalog Age. pp. 112-113.

Muloachy, C. (1992, April). Automation emerges as competitive issue for struggling firms. National Underwriter, pp. 9, 20.

Ott, J. (1992, November). New technology key to airline cost cuts. Aviation Week & Space Technology, pp. 67-82.

Ott, J. (1993, February). Airline customer rated 'average' in survey. Aviation Week & Space Technology, p. 31.

Peterson, D. (1994, September). Technology can provide the keys to efficiency. National Underwriters, pp. 48.

Phillips, E. (1994, March). Airlines' choices: adapt or perish. Aviation Week & Space Technology, pp. 61 - 63.

Rees, R. (1994, June). Smooth landing at air Canada for 140,000 aircraft parts. Industrial Engineering, pp. 28 - 29.

Rouse, W. B., & Boff, K. R. (Eds.). (1987). System design behavioral prospective in design, tools, and organizations. New York: North-Holland.

Solomon, G. M. (1986, Fall) Strategic implementation ATMs: why haven't all the tellers gone? Journal of Retail Banking, pp. 43-52

The new technology: Information system interface with customers. Society of Automotive Engineers: 1990.

Thomas, M. (1993, January). Reengineering: the frantic discovery of the obvious. Modern Office Technology, p. 48.

Thuermer, K. (1992). Time to wake up. Global Trade. pp. 13-14.

Ticketless by united. (1994, September). Air Transport World, pp. 7.

Time-Life Books. (1986). Robotics, Understanding Computers. Time Series Books: VA.

U.S. Department of Transportation. (1989). Federal Aviation Administration.

National Airspace System Plan. Facilities Equipment and Associated Development. Washington, DC: Author.

United States. Office of Aviation Policy. (1990). FAA Aviation Forecasts. Washington U.S. Department of Transportation, Federal Aviation Policy, Office of Documents. Washington, DC: Author.

Vantuono, W. C. (1993, April). VRE: a model computer road. Railway Age, pp. 65 - 68

Velocci, A. (1993, November). Major carriers face tough labor, productivity issues. Aviation Week & Space Technology, pp. 85 - 86.

Weimer, G. (1992, August). Carts, horses, and key people. Industry Week, p. 43-48.

World Aviation Directory. (Summer 1995). The aviation/aerospace industry's standard reference. New York: McGraw Hill.

Zuboff, S. (1988). In the Age of the Smart Machine: the future of work, New York: Basic Books.

APPENDIX A
QUESTIONNAIRE

A. Questionnaire

Having read the accompanying cover letter, please answer the following questions:

Demographic Information:

1. a. Gender: Male/Female

   b. Age: Under 25, 26-35, 36-45, over 45

   c. Manager Supervisor

   d. Education level, please circle the highest level achieved:

   a. High School b. Associates Degree b. Bachelors c. Masters d .Doctors

   e. Number of years in current position _____

   f. Airport location, please give the three letter code _____

2. Please select by circling each item from the items listed below, which of the following you use regularly:

   a. PC computer b. E-Mail c. Fax machine d. CompuServe

   e. America Online

Survey questions (*Please answer the following questions to the best of your ability.*)

3. Do you think it is necessary for passengers to interact with airport customer service employees?

   a. Yes b. No

4. On a daily basis, what is the percentage of time spent interacting with the traveling public? Please circle one:

Limited	Regularly	Continuous interaction
a. (0%-20%)	b. (20%-35%)	c. (Greater than 35%)

Please rate items 5 through 10 with respect to the importance of each when dealing with passengers. Circle the appropriate level of importance, to you, for each of the following:

	Less important				*More important*
5. Security and safety of baggage	1	2	3	4	5
6. Verification of flight related documents:	1	2	3	4	5
7. Public relations:	1	2	3	4	5
8. Passenger comfort and support:	1	2	3	4	5
9. Problem resolution:	1	2	3	4	5
10. Passengers expectation of personal contact:	1	2	3	4	5

11. As an airline manager/supervisor, do you believe there is a need to automate passenger service check-in procedures?

a. Yes b. No

Please rate the following items 12 through 16 with respect to the effectiveness of an automated customer service system. Circle the appropriate level of importance, to you, for each of the following:

	Less important				*More important*
12. It saves time:	1	2	3	4	5
13. Check-in procedures more efficient:	1	2	3	4	5
14. Reduces escalating labor costs:	1	2	3	4	5
15. Greater utilization of technology:	1	2	3	4	5
16. Competitive advantage:	1	2	3	4	5

17. In your opinion, if automation is not an option, please indicate why by ranking your reasons. Please use 1 through 7 to indicate the level of importance for each of the criteria:

a.____Need people contact
b.____Good to always have someone there
c.____Problem resolution is better addressed by personnel
d.____Public image and concern
e.____Employees may feel threatened by automated system
f.____May be too expensive to implement the system
g.____Too complicated to address

18. If automation of passenger check-in procedures become an option, where should it be located? Please select one of the following:

a. Designated, airport, check-in counters
b. Gates and curb side
c. Airport car rental offices
d. City ticket offices
e. Remote, off airport, facilities
f. At all points possible

19. In your opinion, what will be the traveling publics' overall impression of an automated system? Please circle all that apply:

a. I do not know
b. It is a waste of time and money
c. It is too impersonal/isolated
d. I like it
e. I do not care
f. They may want to fly on another carrier where "real people" check them in.

20. To maximize the effectiveness of the automated system, how should it be introduced?

Please select one of the following:

a. One airport at a time, over an extended period of time
b. One airport at a time, switching to the system all at once
c. All airports at the same time, over an extended period of time
d. All airports, switching to the system all at once

Thank You for your cooperation

APPENDIX B
PILOT STUDY QUESTIONNAIRE

B. Pilot Study Questionnaire

Having read the accompanying cover letter, please answer the following questions:

Demographic Information:

1. a. Sex: Male/Female
   b. Age:_____
   c. Position held: Manager/Supervisor
   d. Education level, please circle the highest level achieved:
      High School B.S. M.S. Ph.D.
   e. Number of years in current position _____
   f. Airport location, please give the three letter code _____

2. Please select by circling each item from the items listed below, which of the following you use regularly:
   a. PC computer b. E-Mail c. Fax machine d. CompuServe
   e. America Online

Survey questions (*Please answer the following questions to the best of your ability.*)

3. Do you think it is necessary for passengers to interact with airport customer service employees?
   a. Yes b. No

4. On a daily basis, what is the percentage of time spent interacting with the traveling public? Please circle one:

Limited	Regularly	Continuous interaction
a. (0%-20%)	b. (20%-35%)	c. (Greater than 35%)

Please rate items 5 through 10 with respect to the importance of each when dealing with passengers. Circle the appropriate level of importance, to you, for each of the following:

	Less important				*More important*
5. Security and safety of baggage	1	2	3	4	5
6. Verification of flight related documents:	1	2	3	4	5
7. Public relations:	1	2	3	4	5
8. Passenger comfort and support:	1	2	3	4	5
9. Problem resolution:	1	2	3	4	5
10. Passengers expectation of personal contact:	1	2	3	4	5

11. As an airline manager/supervisor, do you believe there is a need to automate passenger service check-in procedures?

a. Yes b. No

Please rate the following items 12 through 16 with respect to the effectiveness of an automated customer service system. Circle the appropriate level of importance, to you, for each of the following:

	Less important				*More important*
12. It saves time:	1	2	3	4	5
13. Check-in procedures more efficient:	1	2	3	4	5
14. Reduces escalating labor costs:	1	2	3	4	5
15. Greater utilization of technology:	1	2	3	4	5
16. Competitive advantage:	1	2	3	4	5

17. In your opinion, if automation is not an option, please indicate why by ranking your reasons. Please use 1 through 7 to indicate the level of importance for each of the criteria:

a.____Need people contact
b.____Good to always have someone there
c.____Problem resolution is better addressed by personnel
d.____Public image and concern
e.____Employees may feel threatened by automated system
f.____May be too expensive to implement the system
g.____Too complicated to address

18. If automation of passenger check-in procedures become an option, where should it be located? Please select one of the following:

a.	Designated, airport, check-in counters	b.	Gates and curb side
c.	Airport car rental offices	d.	City ticket offices
e.	Remote, off airport, facilities	f.	At all points possible

19. In your opinion, what will be the traveling publics' overall impression of an automated system? Please circle all that apply:

a. Mixed view
b. A waste of time and money
c. To impersonal/isolated
d. Welcomed
e. Indifferent to the idea
f. They may want to fly on another carrier where "real people" check them in.

20. To maximize the effectiveness of the automated system, how should it be introduced?

Please select one of the following:

a. One airport at a time, over an extended period of time
b. One airport at a time, switching to the system all at once
c. All airports at the same time, over an extended period of time
d. All airports, switching to the system all at once

Thank You for your cooperation

APPENDIX C
QUESTIONNAIRE COVER LETTER

C. Questionnaire Cover Letter

Box 144157 Embry-Riddle Aeronautical University
600 South Clyde Morris Boulevard
Daytona Beach, FL 32114

May 12, 1995

Station Manager
American Airlines, Terminal 3
John F. Kennedy International Airport
Brooklyn, NY 11212

Dear Mr. Manager:

As part of a master's degree research project, I am conducting a survey to learn the attitudes of airline managers toward the automation of passenger check-in procedures. The proposed fully automated, computerized system is designed to improve the deployment of personnel to the right places at the right times. It is not meant to eliminate personnel.

I am conducting this pilot study to help validate the survey which will be used for the actual study. By taking a few minutes to reply to this questionnaire, you will help to determine the validity of an automated check-in system. Please feel free to make critical comments or suggestions to any of the questions.

I do understand that this is taking time away from your other commitments. I am quite appreciative of the time you are spending to answer the survey. All replies are confidential and will be used only to validate the questionnaire. Please respond by May 30, 1995. Enclosed is a self addressed, stamped envelope. Thank you for your time.

Sincerely,

Don Bennett
Graduate student

APPENDIX D
PILOT STUDY COVER LETTER

D. Pilot Study Cover Letter

Box 144157 Embry-Riddle Aeronautical University
600 South Clyde Morris Boulevard
Daytona Beach, FL 32114

June 13, 1995

Station Manager
American Airlines
Miami International Airport
Miami, FL 32331

Dear Mr. Manager:

There is a growing utilization of automation within the aviation industry and this trend is spreading to virtually every aspect within. That is, all except passenger services. As part of a master's degree research project, I am conducting a survey to learn the attitudes of airline managers and supervisors toward the automation of passenger check-in procedures. The proposed user friendly, computerized system is designed not to eliminate jobs, but rather to improve the deployment of personnel to the right places at the right times.

Your help is needed to determine whether the industry is ready to accept such a system. By taking a few minutes to reply to this questionnaire, you will help to suggest the importance of an automated check-in system. (I have also included copies of the survey for your supervisors.) I am quite appreciative of the time you are spending to answer the survey. All replies are confidential and at no time will your identity be revealed by the primary researcher. Enclosed is a self-addressed, stamped envelope for your reply. Please respond by June 30, 1995. Thanking you in advance.

Sincerely,

Don Bennett
Graduate Student

APPENDIX E

CHI-SQUARE RESULTS

E. Chi-Square Test of Significance for Responses Between Managers and Supervisors

Response	Calculated X^2	*df*	Table X^2	Accept/Reject H_o
Question 5	3.638	3	7.815	Accept
Question 6	3.779	3	7.815	Accept
Question 7	5.110	3	7.815	Accept
Question 8	1.393	2	7.377	Accept
Question 9	.410	1	3.841	Accept
Question 10	1.365	2	5.991	Accept
Question 11	1.393	1	3.841	Accept
Question 12	1.393	3	7.814	Accept
Question 13	.173	3	7.814	Accept
Question 14	3.608	4	9.487	Accept
Question 15	1.771	3	7.814	Accept
Question 16	2.452	3	7.814	Accept
Question 17:				
a.	8.322	7	14.067	Accept
b.	4.510	6	12.595	Accept
c.	10.043	6	12.595	Accept
d.	2.441	6	12.595	Accept
e.	11.553	7	14.067	Accept
f.	5.520	7	14.067	Accept

g.	14.580	7	14.067	Accept
Question 18:				
a.	.755	1	3.841	Accept
b	.227	1	3.841	Accept
c.	.974	1	3.841	Accept
d.	.307	1	3.841	Accept
e.	.974	1	3.841	Accept
f.	3.246	1	3.841	Accept
Question 19:				
a.	.032	1	3.841	Accept
b.	.332	1	3.841	Accept
c.	.423	1	3.841	Accept
d.	2.676	1	3.841	Accept
e.	.920	1	3.841	Accept
f.	1.648	1	3.841	Accept
Question 20:				
a.	.089	1	3.841	Accept
b.	.122	1	3.841	Accept
c.	.963	1	3.841	Accept
d.	1.213	1	3.841	Accept