Information Systems: Their role and Importance Today, particularly in the Context of an Irish-Based Organisation.

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## Abstract

This report aims to give a researched description of Information Systems and the important role information systems play in modern organisations and business, with examples. We identify and research an Irish-based organization, Aer Lingus that makes use of information systems and describe the information systems they use, their purposes, roles and objectives. We evaluate in detail one of these systems, the reservation system ASTRAL, to determine whether this systems functions as intended in achieving its objectives. We find that ASTRAL is a good information system due to its robustness and adoption among several other airlines, illustrating its use to other organisations.

## Section 1 - Introduction

With the rise of modern computers, Information Systems (IS) play a huge role in providing information to aid decision making in businesses and organisations today. (Brynjolfsson and McAfee, 2014) describe a particular IS in a bank, that takes in numerous financial details in a mortgage application, to provide an advisory that this particular application should be accepted (or not).

Limited use of IS highlights their importance. (La Rovere, 2003), in his case study of Brazilian SMEs, highlights lack of innovation and use of in ICT information flows, which led to limited development out of a short-term competitive mindset among SMEs.

This report aims to give a researched description of Information Systems and their role in modern organisations and business, with examples. In Section 2, we outline what information systems are and why modern IS have arisen. We describe different types of IS that we use today, outlining the roles of each system and their usefulness to users, giving examples.

In Section 3, we identify and research an Irish-based organization, Aer Lings, that makes use of information systems to obtain a competitive advantage in their field. We outline the history and nature of the company, as well as the information systems they use. We describe, in detail, the purposes, roles and objectives of each of these information systems, and their importance in the competitive success of Aer Lingus. In Section 4, we evaluate in detail one of these systems, the airline reservation system ASTRAL, to determine whether this system functions as intended in achieving its objectives. Finally, we summarize this report in our conclusion.

## SECTION 2 – DESCRIPTION OF INFORMATION SYSTEMS

**Introduction and Definition**

Over the past 40 years, technology has rapidly developed and is still developing at a rapid pace. Companies and organisations now require adequate monitoring processes (allowing them to easily alter their particular strategies) and flexible production processes, as technology-intensive and knowledge intensive products have increasingly diminishing life-cycle times (La Rovere, 2003). Today these innovations are achieved by information systems, of which exists a developing field, and the core concern of this field in modern times is:

*“…the orderly provision of data and information with an organisation using IT, that information being relevant to the ever-changing activity of the organisation and/or its members.”*

(Checkland and Holwell, 1998: 39)

Many definitions of Information Systems exist. Zwass defines an Information System as *“an integrated set of components for collecting, storing, and processing data and for providing information, knowledge, and digital products.”* (Zwass, 2016). Checkland & Howell (1998) defines an information system as comprising two systems, a system which is served (the party undertaking an action) and the system which does the serving, namely the processing of data relevant to the party. Alter (2008) lists several definitions of Information Systems by different authors, noting that most are seen as unsatisfactory for various reasons, and this lack of an agreed upon definition acts as an obstacle to the field of Information Systems.

However, many helpful descriptions of how Information Systems work exist in various textbooks, and there are various ways to classify how they work. Bytheway, et al (1995) describe a system consisting of input, process and output elements and gives the example of an invoicing system, described as follows:

1. Input element: Collected data concerning the order is entered into the system by data clerks at a computer.
2. Process element: Total costs, sales or Value Added Tax would be calculated from a selection of appropriate data (e.g. prices from a price database and a particular product description to calculate VAT).
3. Output element: From the calculated data, the results of processing are presented in the form of an invoice. The output can be transmitted over the internet to the purchaser’s computer and then stored on a relevant database.

**Types of Information Systems and their Usefulness to Modern Organisations**

Information systems help businesses reduce costs by increasing the efficiency of certain processes, attract new customers with an easy-to-use system and aid in an organisation’s decision-making (On a Strategic or Management-level) as relevant information can be conveyed easily to the user. This subsection describes different types of information system and highlight’s their role in modern business and organisations.

The above invoicing system that Bytheway, et al (1995) describes is an example of a Transaction Processing System (TPS), a system that captures transactions, creates new information based on the data and storing them in databases for further use. Modern TPS significantly improves productivity and processing times when compared to a handwritten system. Cummings et al (1998) cite the example of Avon Products (handling 12 million handwritten orders annually), who after introduced a document-scanning TPS, reduced processing errors, improved the accuracy of delivery. The introduction of this TPS *“cut order processing times by an amazing 67 percent… led to a decrease in order-entry costs of over 65 percent”*. (Cummings, Dawkins and Haag, 1998: 49) However, an information system requires a robust infrastructure, as Cummings et al (1998) note that cost due to system downtime can be extremely costly for an organisation.

A Customer Relationship Management System (CRMS) is an extremely important management system that seeks to build and maintain long-term relationships with customer and clients, through a blend of sales, marketing and service information systems. CRM Systems enable organisations to collect and store customer data, to provide a detailed view of their customers, on the individual or group level. (Khodakarami and Chan, 2014) A good CRM system emphasizes its ability to change in response to the customer’s preferences, based on what the customer tells it and other information about the customer that the system can obtain. (Bellenger, Johnston and Zablah, 2004) A good CRM system also interacts with the user to provide real-time communicative support to customers (e.g a call centre) and through higher levels of socialization, gather more information on customers, including specific needs and provide better services for customers. A good example of a CRM system providing good feedback to customers in a time of crisis was Oxygen 8’s Engage systems, which provided hundreds of thousands of customers (including Aer Lingus customers) with reliable schedule updates, in the aftermath of a volcanic eruption in Iceland which disrupted air travel in Europe. (Oxygen 8 Group, 2016).

CRM systems are also linked with big data projects, where large amounts of data, sometimes from multiple sources (e.g. browsing habits and online purchases), can be gathered by companies and even sold to other companies who can then transform the data into useful information about the customer (the latter can also be done by the company itself). However, challenges can arise as Van Belleghem (2015) notes that while modern customer sales data is relatively easy to store and analyse, big data contains huge amounts of unstructured data and that the problem is *“to find out which bits of this flood of data are relevant.”*. (Van Belleghem, 2015: 96)

A Management Information System (MIS) is a system that *“provides periodic and predetermined reports that summarise information in a database*”. (Cummings, Dawkins and Haag, 1998: 52) Its main role is to alert people in the organisation to potential problems or relevant opportunities that can arise in a business environment. The system can aggregate relevant inputs (e.g. revenue, customer returns, or enrolment numbers) into an output summarized reports, periodic reports. Cummings et al (1998) give the example of how the PRISM MIS proved its usefulness to Hechinger stores, where it reduced the time to create reports from three weeks to less than a day. PRISM also doubled as a Decision Support System (DSS) for Hechinger Stores (Cummings, Dawkins and Haag, 1998), where the main role of a DSS is to support decision making. A DSS mainly assists in decision-making tasks such as budgeting and project figures such as GPA for a semester; they can perform “what-if?” analyses (what output results from a combination of inputs?) and mainly do this using spreadsheets. (Cummings, Dawkins and Haag, 1998) Certain DSS have important roles in modern organisations, for example the TEDSS in Virginia, which analysed variables such a dispersion rates of gases, wind direction, population distribution and the road system, to determine the best evacuation route in the event of a nuclear disaster. As these variables change over time, this DSS was needed to support decision-makers in their choice of evacuation route. (Cummings, Dawkins and Haag, 1998) Modern DSS provide a significant role is aiding decision making when dealing with either the complex interaction of variables, or large amounts of financial data.

## Section 3 – Information systems of Aer Lingus

***Introduction to Aer Lingus: History***

In this section, we research the Irish organisation Aer Lingus. Aer Lingus is Ireland’s first and national airline. The low-fares airline’s development and success depended greatly on their usage and utilisation of various information systems used in its operations. The evolution of information systems enabled the airline and aviation industry to transform and grow rapidly over the last half century. The implementation of information systems by Aer Lingus began during the 1960s; this early utilisation of technology allowed them to grow and sustain an early competitive advantage on an international scale. Today information systems continue to play a key role in all aspects of Aer Lingus’s operations and support the organisation to function on every level.

Aer Lingus is Ireland’s oldest airline established by the Irish government, the airline was established originally to provide air transport between Ireland and the United Kingdom. It first began flights from the airbase in Baldonnel Co. Dublin in 1936 with a small fleet, and continued to expand in 1940s even in wartime whilst pilots risked their lives to provide an air transport service to Liverpool.

In this report, we research three different information systems utilised by Aer Lingus that have played a principle role in sustaining the organisation competitive advantage. The three systems include a 1) reservation system 2) customer relationship management system (CRM) and 3) an online payment processing system.

***Reservation Systems***

Airlines nowadays use computerized reservation systems (CRS) and global distribution systems (GDS). The purpose of these system is that they allow users to look up flight schedules and easily book seats on scheduled flights. Prior to these systems being developed, consumers purchased tickets either by calling the airlines on a phone or using a travel agent. A single office controlled a flight booking, an index or a flight card was used which then represented a scheduled flight. All information including routes, aircrafts, schedules, reservations and fare information was stored in large books published by the airlines. A travel agent used these large books to reserve and a book a seat on an airline; this process worked but was not efficient. It was difficult to get a real-time view of available seats, this method sustained major problems and flaws.

The complications encountered by the airlines and the travel agents not using an automated system led to the development of computerized reservation systems(CRS). The development of these systems was pioneered by American Airlines. The airline developed several automated airline reservation systems that enabled real time access to the organisation’s data from all its offices. This data was then accessible for various travel agents and booking agents to use. In a joint venture between IBM and American Airlines, the first computerized airline computerized reservation system (CSR) was developed in 1964, named SABRE (Semi Automated Business Research Environment), the first automated airline reservation system in the world.

Aer Lingus knew that to develop and succeed like their American counterpart, they needed to develop and invest in their own in-house reservation system. The Irish airline also contracted IBM to develop and integrate its own computerised reservation system. In collaboration with IBM and Aer Lingus, the development of a system which became known as Advanced System of Telecommunications and Reservations for Aer Lingus (ASTRAL). ASTRAL allowed Aer Lingus to be an advanced early player in the aviation technology field. Aer Lingus’s implementation of their own reservation system was a major step forward; the development of ASTRAL resulted in the system being a valuable ancillary product for the airline. By the 1970s Aer Lingus was selling access to their reservation systems to various airlines internationally. Aer Lingus’s utilisation and implementation of ASTRAL was crucial for their long-term success. ASTRAL is still used and being continuously developed today.

***Customer Relationship Management System (CRM)***

Computerized reservation systems have developed and evolved radically since their creation in the 1960s. A relatively new system, customer relationship management systems (CRM) have become increasing popular and necessary since their development in the 1990s*. “A customer relationship management system allowed firms to collect and manage large amounts of customer data and then carry out strategies based on that information.”* (Bain & Company, 2010). The purpose of CRM for Aer Lingus is that it allows the airline to gather data and create better relationships with their customers. CRM systems technology gives Aer Lingus a major advantage in targeting, engaging and gaining an insight into new and existing customers. The airline industry is very competitive; customers are easily enticed by other airlines. Aer Lingus is regarded as a low-fares airline so it is essential that an efficient CRM system be utilised by the organisation to collect data, and gain and develop an understanding of the growing market of budget travellers.

*“CRM software consolidates customer information and documents into a single CRM database so business users can more easily access and manage it. The other main functions of this software include recording various customer interactions, automating various workflow processes such as tasks, calendars and alerts, and giving managers the ability to track performance and productivity based on information logged within the system.”*

(Rouse, 2014)

The role for CRM systems these days are becoming increasingly important due to the consent sharing and sending of personal data online. The objective of these systems is to gather relevant data and interpret information that an organisation would be able to act upon. In return, a company could then provide a better product or service.

A CRM system is another vital information system that Aer Lingus takes advantage of. Unlike Aer Lingus’s technology strategy with ASTRAL, Aer Lingus did not develop their entire CRM system; the organisation outsourced different aspects of their CRM system to various CRM software providers. Aer Lingus used necessary information systems provided by CRM software and cloud based solutions company Oxygen 8 Communications Limited. Oxygen 8 provides a platform that helps the Irish airline improve customer and staff relationships, and help build mobile marketing databases.

The system that Aer Lingus takes advantage of, allows them to easily engage with their passengers, gather data and reliably contact flyers with essential information. The role of Oxygen 8’s platform and CRM systems has become increasingly important for Aer Lingus. In 2010, a major crisis erupted due to a volcanic ash cloud from Iceland, which halted many European Airlines. A good CRM system helped the airline cope and became a reliable resource. The airline used these systems to send over a half a million text messages to flyers during the crisis. Stated by John Collins, information systems manager with Aer Lingus about Oxygen 8 platform Engage:

*“With Engage, we can reliably and instantly contact hundreds of thousands of passengers in one go, as we had to do during the volcanic ash situation. We’ve benchmarked the solution retrospectively which has confirmed that Engage still leads the pack.”*

(Oxygen 8 Group, 2016)

Using CRM systems in Aer Lingus’s operations comes with countless benefits, for both the airline and its passengers. The decision to outsource various aspects of their CRM system to Oxygen8 helps Aer Lingus’s objective to provide a high standard and differentiated customer service, yet at a reduced cost.

***Online Payment Processing System***

The development of information systems has facilitated the creation of new distribution channels. As we discussed earlier the main method of booking a flight before the advancement of information systems, was done by either calling the airline or going to a travel agent. Nowadays, the main distribution channel for Aer Lingus is their website [www.aerlingus.ie](http://www.aerlingus.ie). This system facilitates most the organisation’s bookings. Integrated into Aer Lingus’s website is an online payment system. *“The on-line payment systems are e-commerce businesses allowing money transfers to be made only through Internet (most of them maintain fully functional mobile applications”* (Transact.money, 2016)*.* The purpose of an online payment system is that it allows a customer to reliably, securely and easily make a payment online. After the customer makes the payment, the system then receives it and processes it. Noted by Pól Ó Conghaile of the Irish Independent on Aer Lingus’s online website. *“The website accounts for 80pc of bookings across its network, and generates more than €1 billion in annual revenue.”* (Conghaile, 2015). Aer Lingus’s website has developed into the company’s main distribution channel. To deal with vast amounts of online payments securely, Aer Lingus contracted Irish payment processing service provider known as Realex Payments. The airline needed to transform and update their payments system, so the role of Realex payment system was to provide flexibility whilst also meeting the requirements for Aer Lingus’s growing online platform. Realex payments provide a payment system that is integrated into Aer Lingus’s website, the airline took advantage of this payment processing engine in 2004 and have utilised it with their online system ever since.

The integration of Realex’s payment system internally into Aer Lingus’s online system was the key element to the partnership between the airline and the payments solutions provider. Incorporating one system into the other provided for a better user experience for Aer Lingus customers. Fliers weren’t rerouted to other webpages and didn’t have to go to external payment systems when purchasing a seat. The systems working together allowed for customers to book and pay for a seat all from within Aer Lingus’s website. The objective of Realex payment system and the Aer Lingus’s online system was to allow for customers to easily and securely purchase products and services online, these goals were achieved when each company’s systems worked together. Aer Lingus utilising Realex payments system enables the airline to achieve a competitive advantage over other low fare airlines, the payment system helps provide a state of the art modern website. Other airlines such as Ryanair have utilised external checkouts and payments processing systems such as Paypal. Although these methods are efficient, Aer Lingus’s customers don’t have to go through as many steps to make a secure a payment.

Reservations systems, CRM systems and online payment systems are three of many complex information systems that are taken advantage of by Aer Lingus. The impact and the importance that these systems have had on Aer Lingus and their customers is immeasurable.

## Section 4 – Evaluation of the ASTRAL reservation system

We examine various systems used by different airlines and now evaluate that the ASTRAL reservation system developed by Aer Lingus and IBM is good well developed system. Aer Lingus licensed their ASTRAL system which was one of the first major international aviation deals, a major step in building Ireland’s reputation as an international aviation hub. The ASTRAL system is still regarded to this day as a well-developed and advanced system. The system is still used today and Aer Lingus provide it to various airlines internationally such as Malta Air, Kuwait Airlines, Iceland air and VLM. (Centre for Software Engineering, 2016) This clearly shows the value that other companies see in the ASTRAL system. The development of the system was outsourced to IBM, who regarded the system as the most advanced airline booking system in the world at the time of its introduction. IBM used to run an advertisement in 1960s to celebrate their development of the ASTRAL system they developed for the Irish airline. An old IBM advertisement states, *“You’d be surprised how many Irish people fly IBM”.* (IBM, 2016) IBM developed the first ever CRS and to this day IBM still provide Aer Lingus with systems which are regarded as leaders in this field. The ASTRAL reservation system utilised by Aer Lingus allows the airline to deliver an efficient and a smooth process for customers reserving seats. ASTRAL reservation. From these findings, we consider ASTRAL to be a good information system.

## Section 5 – Conclusion

This report aims to give a researched description of Information Systems and their role in modern organisations and business, with examples. In Section 2, we outlined what information systems are and why modern IS have arisen, describing different types of IS, including Customer relationship management systems, transaction processing systems, decision support systems and management information systems. For each type of IS we presented an example of its usefulness to the organization using it.

In Section 3, we identified and researched an Irish-based organization, Aer Lingus, that makes use of information systems to obtain a competitive advantage in their field. We described three IS that the company, it’s Airline Reservations system, ASTRAL, its Online payment processing system, designed by Realex payments, are it’s CRM system, designed by the Oxygen 8 Group. Finally, we evaluated one of these systems, the airline reservation system ASTRAL, to determine whether this system functions as intended in achieving its objectives. We determine that the ASTRAL System is a good system, as its usefulness has endured since it’s development in the 1960’s , without the need for a system overhaul. We also find that it is a good system through the value that other airlines see in ASTRAL, shown by their willing to purchase the system from Aer Lingus.

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