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Research Article

The Effect of Increased Reliance on Information Systems and Relational Databases in Airline Industries: A Case Study of British Airways

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Abstract

In spite of the general acceptance of the information systems and relational databases, a true understanding of how these systems really affect the airline industry is far from fetched. The knowledge acquired of Relational Database Management Systems and Information systems inaugurate these days a major shift of appraisal in large organisations in the whole world. The formation of a database engine is still a major challenge to the human mind since there are particular areas in which a final solution has not been attained. For example, the requirements of how video, images, sounds can be stored appropriately. Information systems and relational database systems are debated continuously on their relative importance of its relevance although the trailing of rigor in an airline industry is relevant. The result shows that further effort is needed to ensure a practical understanding of the risk involved as well as the benefits in relying on these systems is established. This research informs the Aviation Sector on the unique role played by these systems and how it can make or break their organisation by analysing in depth on what information systems and relational database systems really are how they work and how they can be managed and developed into better practice.

Keywords

Information systems; Relational databases; Associated risks; Increased reliance; British airways; Airline industries

Introduction

The adoption of information systems and relational database systems in the airline industry has been growing at a rapid speed and has progressed from the automation of structured processes to extended systems that are genuinely revolutionary such that changes have been initiated into fundamental organizational procedures. It has long been assumed that the airline industry cannot live without the help of computers that is why these industry shaping their structures and strategies in order to incorporate these systems into the industry. Though the relevance of the relationship between these systems and the changes expected by the organization is greatly believed but there is an absence of comprehensive analysis and proof of these issues from the analytical perspective [1].

Computers are very essential in an airline industry today because it is used to book or cancel customer flight, pay for travel ticket without having to go to any of the airline work in offices, check flight availability and handle all customer related operations in the industry. Because of all these so many concurrent activities going on, the airline industry has found an increased need to organize customer data and be able to produce these data when it is requested. As the industry expands the need for more reliant system highly demanded, this is where information systems come in to operation [2].

It examines direct application of software development and design to the industrial territory by preventing loss or damage of data and perfects the work and unification processes and it documents and monitors the operations of other systems in the airline industry. There are many wrong assumptions about information systems that it is meant for computing programming experts alone whereas an average user has so many reasons to learn how to use it if they want to be more effective in their businesses in order to satisfy their unending customer demands [3].

History of British Airways

British Airways is a global well established airline transportation industry that was originated in the year 1919. It is considered an industry-leader because of its profound long years of stable experience in the airline industry. It is the founding member of the one world alliance and the 5th largest global airline in RPK's 2002 figure [4]. The industry has 45,000 employees situated in 100 countries worldwide and these employees assist approximately over 40 million customers in a year arrive at their final destinations.

British Airways mainline fleet comprises of approximately over 270 aircraft composed of 9 different aircraft types that controls its operational functions from the world's largest international airport called the London Heathrow. It functions in a market distinguished by governmental regulations, over-capacity, geopolitical effects and high competition caused by low cost carriers which causes a persistent battle for long term survival amongst all airlines in the airline industry [5].

British airways customer relationship management group encompasses regional offices that generate independent marketing campaigns that are essential in fragmented operations and the prospective for inessential communications. The customer relationship management department was founded in the year 1990 at British Airways, before then it was the Analyst Team whom usually used Business Objects and SAS for analysis to identify various audiences and dragging away contact files for proper execution of each campaign. After which it implemented an oracle Customer Data Warehouse called the Ocean wave which took 2 years for the Analyst Team to operate on during campaigns and reporting due to the fact that it had a lot of problems such as the complexity of its data structure was absolutely different from the pre-existing systems which made it hard for them to understand and was time consuming for them to use and the query response as well as its performance was slow and complicated [6]. In response to all these pressures and many others, the British Airways introduced a program called the Future Size and Shape in the year in 2002 with the aim of eradicating complexity and reinstating the airline

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industry to sustainable profitability position by introducing the relational database systems and information systems into the airline industry as a result of fixing the loop holes in its core business, finding better way to secure data when disaster strikes such as the September 11th attacks, increasing marketing speed and so much more [5].

With the fast growing rise in communication, industrial activities and business processes, the need for a faster and more reliable source of interaction and data storage in the airline industry has become inevitable [7]. The use of a desktop database management system has long been replaced by the relational database management system in the airline industry, because of its ability to store and retrieve data easily in a table format and its extensive ability to connect to other relational database tables in other locations [8]. The combined use of both information systems and relational database management system in the airline industry will cause an easy access of data, safe and secured data and a continuously fast growing airline industry that will satisfy their customer demands to perfection [9].

Introduction to Information Systems

Information systems are strictly a set of interrelated components that extract, process, save and distribute information to aid decision making and control in any given organisation by assisting the various levels of staffs handle obligations properly such as analysing problems, visualizing complex subjects, creating new products and helping in the day to days affairs of the organisation. These information systems accommodate information about notable places, people and things inside the airline industry and its surrounding environment. These information means already shaped data into a meaningful form that can be relevant useful to the staffs or customers in the airline industry. Data in variation means streams of raw fact that represents the event that happen or that are happening in the industry or in as physical environment before they are categorized and put into an orderly form that the staffs or the customer of the industry can understand and make use of appropriately [10].

An example regarding information and data is an online checkout page in the British Airways website which scans millions of data pieces such as bar codes to describe the airline vacant seats. These data pieces can be analysed and totalled in order to provide meaningful information like the total number of economy seats booked in a day in that particular country, which travel class tickets are being sold the most rapidly in that country or the total amount spent on each flight journey on maintenance from that country. The activities that produce the information in information systems which are needed by various organisations in decision making, problem analysis, operations control and the creating of new services are the input, processing and output. The input collects raw data from inside the industry or its surrounding environment and the processing transforms these raw inputted data into meaningful forms while the output is used to transfer the information which has already been processed to the end users who will make use of it or to the specific activity in which it will be used [11].

Introduction to Relational Databases

Databases have been in existence much longer than the modern computer even though the word database did not come into regular usage until the year 1960 which was after the innovation of the magnetic disk. Data was formerly stored on paper tapes or punched cards and used with different types of mechanical devices an example of one of these applications was Herman and Hollerith's tabulating and sorting machine which was developed in the year 1890 in order to automate the US census procedures. This procedure would have taken over ten years to accomplish minimized by this automation to just two and a half years [12].

Perspicuously data storage was in existence long before this time but calling these a database will depend on which angle an individual makes their definition while putting into consideration if data query, data sorting and over writing a mandatory prerequisite is regarded. Obviously in the world today no database will attain completion without such facilities because data must be persistent in order for it to have the feature of being available for use when required. Since the emergence of electronic computers in combination with the magnetic hard drives, database systems have become of great significance and value in the airline industry. The accounting programs will need to save all the existing details of financial transactions made in the process of flight bookings, hotel reservations and the computer programs need to be able to process new or current data as well as build up past information and data from the former sessions are needed to be available in its complete form to enable detailed analysis of the transactions [13].

The relational database management systems also known as RDBMS for short were brought into sight in the year 1970 by E.F Codd whom is a mathematician that achieved his degree at The University of Oxford and amalgamated with IBM in the year 1949. The purpose of E.F Codd, was to remove the stress of controlling and looking for information away from the customers and make it easier for staff's to find whatever information they need by providing an interface that accepts simple and appropriate commands through the use of tables which can also be referred to as relations [14].

Systematic Challenges

The major problem is because of the goodness of these systems in the nearest future there might be a total reliant on the systems which means that there will be no need for humans anymore as these systems are taking over the human ability through the help of artificial intelligence but what the world is forgetting is that these systems do not have logical reasoning to handle issues associated with solving problems logically [15]. Presently, information systems and relational database systems are being embraced in every part of the business world but not withstanding this research claims that the pitfalls and doom of the airline industry cannot be avoided if these systems are increasingly relied upon and if the correct understanding of the uses of these systems and how they work are overlooked [16].

Project Aim and Objectives

To investigate the unique role played by information systems and relational database management systems on the performance of British Airways.

To examine the concept of information systems and relational databases.

To investigate whether information system play a significant role in the performance of the airline industry.

To identify the relationship between relational database management system and the airline industry.

To identify the major challenges associated with the implementation of information systems and relational database management systems.

To investigate the risk involved with an increased need for information systems and relational database management systems. [7]

Literature Review

Oz states that information is data which have been processed in order for them to become meaningful. This is an essential process which is used to obtain information that includes the collection of data and the subjection of the data collected to a transformation process in order for information to be created. Laudon [11] states that systems are the gathering of several components which work together to achieve similar goals such goals are to accepts inputs and change these inputs into outputs. These systems have many other systems incorporated in them which have sub goals but not all systems have many goals, some have just a single goal they need to achieve.

Bociji suggests that information systems aims at providing information to organizations which will help them in making swift and accurate decisions to ensure that the organisation is kept under control [17]. These information systems have various types that an organization can make use of such as the open and closed loop control systems [18]. The open- loop control system, has no way to guarantee that the objectives for a process are being fulfilled which means when used in a complex organisational environment they will not be suitable while the closed – loop control system have two category of control mechanism known as feed forward which puts in prediction element inside the loop of the feedback control and feedback control which makes a way for a system to be put under control [19].

Even the governments also make use of information systems in order to supply affordable services to their citizens by delivering various digital goods, of a kind like electronic books for public libraries and online services of a kind like auctioning of goods and social networking while people are reliant on information systems through connecting with the internet such as shopping, social media, banking and entertainment [20].

Concept of Information Systems

Information systems have several types that can be used in an organisation. These types are used in several organisational levels so that different persons perform several individual task, by so doing the work is not overload for a particular department as information as well as the work is shared evenly among workers such as the strategic level which are for the senior workers in an organisation to enable them make long term decisions that can make or break the organisation such as the location the company should open a new branch.

The management level which are for the middle managers which make decisions such as employing and sacking of staffs, the knowledge level which are for the knowledge and data workers whom are the major workers in an organisation because they bring ideas and experience into moving the organization forward. They make decisions such as how to design the company facilities an example of a knowledge worker is a company's engineer. The operational level is for the operational managers who are on the lowest level in the organisation. They make day-to-day decisions in an organisation such as customer service and an example is a teacher [9]. The Figure 1 is showing the various types of information systems in their different organizational levels in an organization.

Concept of Relational Databases

Relational databases are one of the most relevant most relevant and precedential technologies being used in most of all the real world applications at various organisations today because relational databases are computer system software tool that are used for maintaining, updating and retrieving company records [21]. But that there are few problems associated with relying on these relational databases such as data redundancy due to the fact that there is irregularity in its data frequency since the only way for connection between tables is through the foreign key and these redundant data causes the database to become abnormal while null values may fill up the whole database. Also, Demba [22] suggests that for these redundancies to be reduced in a relational database system, an algorithm known as the minimal cover can be introduced by computing the closure of a given set of attributes after which the redundant attributes can be removed. An illustration of this minimal cover is presented below.

Definition 1

Let R be a relation, a set of attributes X in R is said to determine functionally another set of attributes Y in R, it is written that $X \rightarrow Y$, if each X value is connected with exactly one Y value. After which, R is said to satisfy the functional dependency of X [22].

Definition 2

Let F be a set of functional dependencies in a canonical form, if each one of functional dependency $X \rightarrow A$ in F, then A is a singleton attribute. Henceforth, every functional dependency is supposed to be in canonical form.

Given a set of attributes X and a set of functional dependencies F, If X+ become the set of every attributes that depends on a subset of X in respect to F so that $X \rightarrow Z \in F$ then, X+ can be called the closure of X in respect to F [22].

Information Systems Significance

Basically, information systems play a very important and supportive role in most sectors of the airline industry [23]. The impact of information systems on the performance of airline industry
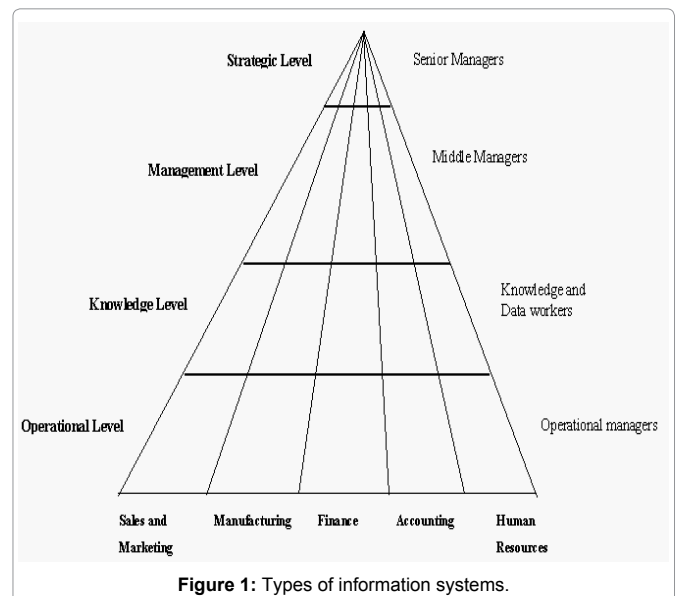

Figure 1: Types of information systems.

and the relationship between its productivity and performance is of substantial interest to many researchers and research [24]. A monumental number of researches have been related with the performance of the airline industry beginning with Bygstad (2005), which contains the model technology acceptance. And also, DeLone and McLean [25] spotted several factors for the positive result of information systems such as information quality, system quality, system use, individual impact, user satisfaction, and organizational impact. After this has been done, In Seddon [26] in his addition to the work of DeLone and McLean [25] recommended their factors and included other success factors.

The airline industry has inputted a great investments in information systems recently, but despite of all this, the effectiveness of information systems performance has proved exceedingly difficult and this impact is having many sides and is including various aspects such as the work and tasks of the staffs in the airline industry tasks and other aspects that will be discussed in Clarke [27]. Dawson [28] studied the impact between information systems and the airline industry by investigating the performance on different factors such as system quality, the use of information system and information quality and performance.

Some primary data was collected from the staffs in the airline and it was concluded that the factors mentioned earlier was affecting the airline industry positively with evidence which implied that the satisfaction of the airline industry customers is a very important factor that influence the use of information system [29]. Several other researchers have ventured to understand these factors more deeply by identifying their impact on the airline industry performance in a more accurate way. Wierschem and Brodnax [30] discovered the impact of improving treatment of computers processors speed on the productivity of the airline industry for customer satisfaction.

This was a well monitored laboratory experiment which was organized to evaluate the impact of the processor speed on the output of the airline industry customers. From the results achieved from the experiment, it was discovered that the productivity of the airline industry towards their customer, as evaluated by an elevation in the volume of work has improved drastically [31].

From all the great research findings from various scholars as stated above, they have been able to establish various important conclusions on some unquestionable factors and their reciprocal actions that influenced the performance of the airline industry such as system quality and the use of the system have ameliorated the earlier models and have improved more comprehensive models. It has also orchestrated new empirical investigations on the impact of information systems on the airline industry performance [32].

The drawback was that most airline industries carriers began to reduce their fares in order to keep former customers as well as attract new ones which lead to a price warfare among the airline industry putting a number of small airline industry carriers across the globe out of business [28]. This made the British Airways airline industry think of a better way of becoming more cost effective and efficient so as to stay with the competition and in turn be the best. Nevertheless, the introduction of information systems into the British Airways airline industry has really facilitated the aim of making travelling via air more affordable to their customers of modest means as customers who book for ticket via a website save a lot of cost. As of now, British Airways travellers have saved over 6 billion pounds on fares annually after the incorporation of information systems [22].

Threat of New Entry

Information systems which are developed and then supplied by information systems professional vendors are usually very expensive. An expensive system will therefore increase the start-up cost of a new entrant. Unlike computer reservation systems, which are expensive as well but can be shared amongst airline industry partners in order to reduce cost and to protect their market which is already in existence and to obtain new market share [33].

Nevertheless, the strategic advantage which an information system provides will make an airline industry feel reluctant to share with other airline carriers in order to reduce costs because the British Airways airline industry makes use of information systems in order to enable them make their market share stronger and integrating alongside with their distribution channels and travel agents. Information systems also provide fares on time and information for available seats to various destinations as well as imposing an entry barrier to various potential entrants [34].

Bargaining Power of Buyers

Information systems grants the British Airways airline passengers more bargaining power by offering them with more and better choices and also by meeting up to their expectations with the expected price. It provides customers with better product since they are getting the same product as well as the same service for lower prices. If customer relationship management programs were not designed with the consumer in mind, they wouldn't have been able to survive [29].

Information systems aids the airline industry regain control from the customer reservation systems and travel agents by forcing them to trade airline seats as specified by the airline accordingly and adjusts interface with the customer reservation systems and travel agents [35]. Information systems can also assist with the upkeep of customer reservation systems and travel agents switching cost by eliminating the manipulation of airline fares that are usually done by travel agents in order to prevent spoiling the image of British Airways [36].

Threat of Substitutes

One of the functions of information systems is that it automatically shows the empty seats at lower prices to those individuals who would otherwise not travel. This is particularly true for those leisure travellers who are very price sensitive. This is called a win-win case for the airline industry and their customers because it makes the airline products as well as services more competitive to others such as ship and rail [37].

Bargaining Power of Suppliers

Information systems that are used within the airline industry will drastically reduce the bargaining power of aircraft suppliers because with the of information systems the airline industry are having a better understand of the situation in the market and their customer demand in terms of the best optimal compartment size and the capacity of the airline seat that can be easily illustrated to customers during ticket sales due to the fact that the airline industry will be able to state and negotiate the aircraft configuration requirements instead of the predefined aircraft configuration requirements that are administered by the aircraft manufacturers [25].

Rivalry amongst Existing Competitors

The possession of information systems will make the airline

industry more cost effective over its competitors by constructing timely and accurate pricing updates and decisions of its entire itinerary in the operating network according to the situation of the market. Information systems will provide decision support to the airline industry in order to manage more routes with less route controllers. Information systems brings about cost effectiveness and efficiency in the airline industry when used effectively and it can rapidly change the basis of competition by matching the competitors closely with the aim of further undercutting in order to compete for routings that has a weak demand [38]. The Figure 2 is an illustration of the Porter's five forces and how the introduction of information systems has brought about innovation in the airline industry resulting in the industry expanding rapidly.

Relational Databases and the Airline Industry

In order for a geographically diverse business to be profitably and effectively managed is determined by a stern yet resilient control and tracking of all collective data streams. Also, it is very essential to use the latest database technology to provide immediate access to information which are continuously updated, securely stored and on hardware that are high-performance and reliable. In order to attain such heights, the British Airways airline industry perpetuates a complex series of databases that runs on a diversity of interconnected and many times on interdependent database systems [6].

These database systems are mostly controlled from the British Airways two major data centres located at Heathrow Airport in London, United Kingdom. These two data centres focus on the maintenance the DB2 and IMS databases, which are the key database in the British Airways airline industry. The DB2 is a type of relational database management system whose key strategy is to handle large application databases all over the world [6]. DB2 was introduced as the principal means to amalgamate the benefits of relational databases and fast transaction processing in order to provide a platform on which the British Airways airline industry can develop the organizations various intensive data business systems [7].

In the past, the British Airways airline industry has developed several types of DB2 applications but the performance and availability of the database systems in regards to the services that was provided to the customers of the British Airways airline industry was not meeting up to standard and still needed some improvements so it was basically improved by the replacement of the standard IBM utilities with a particular purpose built tool [22].

This change created a faster throughput of interpretative processing functions across all of the organizations production systems, it helped in minimizing planned and unplanned downtime and made the organizations data recovery faster and more reliable [39]. The British Airways was able to achieve this goal by sorting suppliers with the ability to become a service partner to the organization which will be of a great benefit to both parties, giving the British Airways airline industry a continuous flow of access and supply to many new technologies at the development stage and also it will provide the supplier with an assured and a long term contract.

British Airways has a lot of experience with the relational database management system because the organization used the relational database management system to lessen the time taken to attach new terminals to the British Airways IMS system [38]. The relational databases is a vital factor in a fast changing marketplace because the airline industry uses it to connect to new customers as
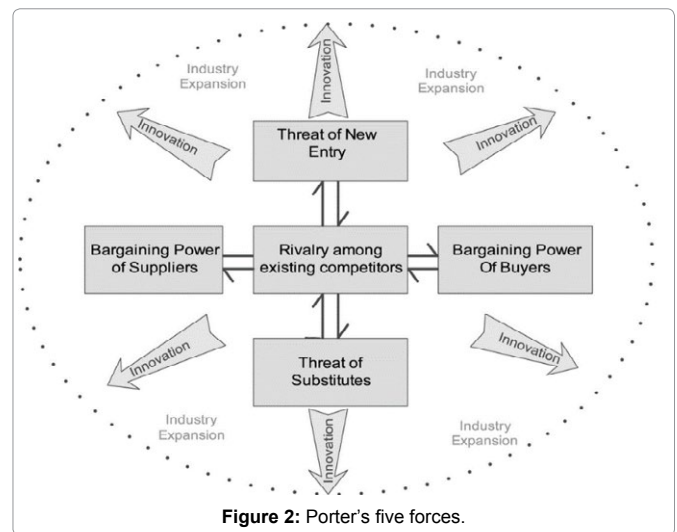

Figure 2: Porter's five forces.

well as relocating already existing staff or customers as fast as possible when necessary [33]. It also aids the British Airways airline industry distributes the organizational service goals and control costs because any individual around the world who has access to a computer can find any information that are required through the relational database system [40].

After the British Airways airline industry has built the relational database for DB2 and was very impressed with the results that were obtained and also the level of technical support and sales that they have achieved, the airliner industry decided to take further steps by implementing some comprehensive and integrated suite of products for resource, recovery, backup and performance management [20]. British Airways eventually installed wide range relational database software of DB2 products in order to secure maximum availability of data with the use of high speed utilities, recovery products and backup. One of the most vital issue driving British Airways airline industries forward is a need for providing a 100% data availability and to become a 24×365 IT organization [40].

This is very important to an organization where staff and users around the globe need instant accessibility to a broad range of information whose lack of availability can result in a loss of organizational profit and this can affect the reputation of the airline industry. The relational databases stores complex data models of a whole year of airline operations and it can be estimated to about 380,000 flights per year. The earlier versions of various database technology applications were not fast enough in handling the complex models that are needed to improve the efficiency of operations to perfection as necessitated by the British Airways airline industry [33].

With relational databases being part of the solution of the airline industry benchmarks revealed a 5X total performance advantage which enabled the reading of between 800 to 1000 distinct object graphs in a second. Relational databases are used in the areas of applications that have the major demand in performance requirements within the British Airways airline industry [6].

Risk of Increased Reliance

The digital age is all about moving on an era by integrating through information systems and relational databases has brought people together and moved organisations forward. This has taken

organizations from the traditional database and paper based systems into the digital age and with this elevation in technology [13]. British Airways airline industry has seen the need to be dependent on these systems but the down side that says too much of everything is bad, the airline industry is now almost totally dependent on these systems which can in turn cause major disaster if the needs of dependency keeps increasing [41].

Information systems can streamlined the business processes of the airline industry which can end up in causing job redundancies as the need for humans to work will be no longer useful [42] which will lead to downsizing of staff in the airline industry as customers will be able to perform most of the task by themselves and also most of the manual worked done by staff in the company will bend up being outsourced to other IT firms whom can handle the information systems properly [28]

This may result in an environmental disaster such as theft and robbery as majority of the staffs in the lower and middle level jobs will be put away with causing more individuals to get stranded by becoming unemployed. McManus [35] stated that it is agreed that information systems have helped in making may communication quicker, more convenient and easier but it has also brought across some privacy issues such as cell phone signal interceptions, hacking of emails and other information on the internet and creating worries for individuals who believe their private information is being sold out to various organizations and has become an information known by the public.

Schwalbe [23] noted that organizational experts strongly believe that the introduction of internet has caused a big issue in the area of job security because with the fast changing demand in technology staffs in the airline industry have to be in a constant learning mode due to the fact that technology keeps on changing daily so that is the only way that the staffs can use in retaining their jobs. Gharajedaghi [32] explained that these information systems has now made dominant cultures to overrule how the whole world should operate such that individuals from the weaker cultures are now acting like those from the stronger culture such that the British airways airline industry are fast copying the styles of the Americans while branches of the British airways airline industry that are non-English speaking are no more speaking their own languages but trying to speak only English in an attempt to copy the British language from the headquarters in Heathrow, London.

Date argued that information systems may not always function properly because they can be a number of problems during organizational day to day activities such as break down of systems, interrupting smooth operations and causing the whole days operation to be completely put on hold, this can make the British Airways customers to be a whole lot dissatisfied for example, the customers may be held down by system failure in the airport and will be told that they have to wait until the system is back [14].

In airline industries, the reliance of relational database on data storage has signified a major constraint in machine performance due to the fact that sometimes if the number of tables that is between the relationships that is to be entrenched are very large, the tables located in the database will affect the performance in the response to the sql queries, this will in turn cause flight schedules and availability including all other records of the British Airways airline industry to be unavailable for use until further notice [6].

Also, there can be the risk of slow extraction of a data meaning if the data was originally organized and stored in a hierarchical order [2]. The customers and staff in the British airways airline industry, may need very powerful computers as well as data storage devices due to the fact that relational database management systems are built in a way to hide complexities that are associated with implementation and to hide the details of the physical data storage from the customers and staff in the airline industry because of this without a very powerful device to manipulate these data, the data would remain inaccessible [22].

This is a big problem because the British Airways airline industry is located In both developed and under developed areas whereby not all the individuals in these areas possess these powerful computers or devices so therefore without a manual process a lot of information will be not be attainable to the under developed areas causing the organization fewer business deals and profits in such locations. Also, Kozub [16] suggested that these relational database systems even though they need power systems to operate on it but they are easily designed which can cause poorly developed database systems. This may put the company at risk if all the company data is located in the relational database since hackers and theft can break into company record and still customer details by just getting hold of any power systems worldwide [5].

Conclusion

The paper uncovered embryonic impact of information systems and relational databases in airline industries regardless of the challenges encountered during implementation process as detected during the literature review [34]. Information systems and relational databases help in great deal the business processes of the British Airways Company and that is good when implemented well shepherds outstanding results to empower the British Airways Company accomplish its competitive edge in the airline business market worldwide, this view can be linked to what was said by [17] that information systems out rightly manipulates business success and competitiveness. Strategic aspect of information systems and relational databases provides a clear idea that airline operations supposed to be undertaken within the airline industry, the creation of strategies provides the possibility for organizational goals and objectives to be attained [37].

Also, since the introduction of these systems some British Airways staffs have been laid off jobs and most customers do not purchase their tickets from an agent anymore as they can do it themselves online which has brought about unemployment for these sales agents thereby reaching the definite findings [14]. An increased reliance on information systems and relational databases in British Airways, whether from the internal or external point of view, helps the company's staffs and customers gain technological knowledge from other airline company. However, although these systems are beneficial in various ways to airline industries, but the realisation that these systems cannot have instincts and emotions that humans have in order to tackle situations when problems arise should not be taken for granted. It must be observed that the advancement of every business depends on the goals formed and attainment extrapolated from the designed objectives [22]. For further research, a closer view at the comparative analysis of information systems and relational databases within the context of more several airline industries can be implemented.

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