Date of publication SEP-30, 2023, date of current version MAR-28, 2023.
www.computingonline.net / computing@computingonline.net

Print ISSN 1727-6209
Online ISSN 2312-5381
DOI 10.47839/ijc.22.3.3226

Development of an Investment Management Model for Air Carriers

KAMILLA G. SADVAKASSOVA [1], AZHAR Z. NURMAGAMBETOVA[1], GULMIRA E. KASSENOVA1, ZHANAR S. KAZBEKOVA[2], DARIYOUSH JAMSHIDI[3]

[1]Department of Finance and Accounting, Al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan
[2]Department of Accounting, Analysis and Audit, Narxoz University, Almaty, Republic of Kazakhstan
[3]Department of Management, College of Economics, Management and Information System, University of Nizwa, Nizwa, Sultanate of Oman

Corresponding author: Kamilla G. Sadvakassova (e-mail: kam.sadvakass@hotmail.com).

ABSTRACT For Kazakh airlines, the issue of using information technologies (IT) is relevant and complex, since the increased competition and partially identical business practices by companies in the same industry force the accelerated implementation of such technologies in their activities. It is necessary to consider and systematize information technologies and systems used by leading air carriers in order to structure them and determine the formats of their use in airlines. The methodological framework of the study consists of the dialectical, system, and historical approaches, fundamental provisions of economic theory, the theory of information economy and innovative development, and studies conducted by scientists-economists devoted to the development of the information society and the problems of company functioning in the information economy. As a result, the investment project assessment for the implementation of information technologies was calculated, which clearly demonstrated the capabilities of such systems as a tool for improving competitiveness, and proved their fast payback period and positive impact on the company.

KEYWORDS investment; information technology; market; air transportation; work efficiency.

I. INTRODUCTION

IMPROVING the efficiency of the airline company requires special attention to the processes associated with its information activities. Such important areas of work as the activation of innovation activities, the introduction of information security systems, and the provision of areas of work aimed at meeting the needs of consumers as fully as possible are strongly connected with the effectiveness of information activities [1]. The solution of these tasks is an integral part of the information activity of the enterprise, which in modern conditions is one of the main factors affecting the efficiency of its work [2]. Such activities are carried out through the influence on the economic policy of the company, the implementation of the marketing strategy, and the development of information and communication activities [3]. The directions of information activity are determined by its goals and the tools are chosen to achieve certain goals. Given the trends in the development of aviation, information activities are associated with many areas of the airline company's work [4].

The role and place of the information resource as an integral part of the airline company's information activities is the information support of management analysis and new management capabilities [5]. Therefore, one of the important tasks of the company is to create a sufficient and rational information flow [6]. A single information space consists of such components as information resources, means of information interaction between users; organizational systems that provide collection, analysis, storage, and transmission of information [7]. The establishment of the information and economic space radically changes the nature of the company's management. The information and economic space can be defined as a set of information resources of the economic system and the means of processing them, information systems, and telecommunications networks that operate based on common principles with common rules. The basis of the information and economic space is information resources and the means of their processing [8].

For Kazakh airlines, the issue of using information technologies is relevant and complex, because increased competition and partially identical business practices of companies in the same industry force the accelerated implementation of such technologies in their activities. The information technology market is one of the most dynamic, with innovative developments occurring much more frequently than new services that air carriers can offer [9]. The term "technology" means a complex of scientific and engineering knowledge implemented in the material, technical, and labor factors of production, and ways to combine them to create goods and services that meet certain technical requirements

[10]. On the other hand, information technology is a set of methods, processes, and ways of using computer technology and communication systems to create, collect, transmit, search, process, and distribute information to effectively organize people's activities. The analysis of the characteristic features of information technologies and the ways of their most rational application allows for increasing the efficiency of the airline's information activities as a whole [11].

In the information society, the processes of informatization and computerization allow companies to work with many sources of informatization that provide a high level of automation of information processing in various fields [12]. Informatization is the socio-economic and scientific-technical process of creating optimal conditions for meeting information needs and intensifying the economy through the introduction of information technologies. In turn, computerization is the process of providing individuals and production teams with computer and communication equipment, as well as appropriate software [13]. The ultimate goal of such measures is to leverage information technology as a key factor in enhancing the effectiveness of the organization [14].

The purpose of the article is to review and systematize information technologies and systems used by leading air carriers in order to structure them and determine the formats for their use in airlines.

II. MATERIALS AND METHODS

The methodological framework of the study is the dialectical, systematic, and historical approaches, fundamental provisions of economic theory, the theory of information economy and innovative development, as well as the studies of economists devoted to the development of the information society and the problems of the functioning of companies in the information economy [15]. Notably, the management of information activities of the airline is a complex process, the study of which should be an important tool to improve the efficiency of the airline company.

The criteria and rationale behind the use of these software systems by Western airlines include the need to improve operational efficiency, enhance customer service, reduce costs, and increase revenue. Enterprise Resource Planning (ERP) Systems such as System Analysis and Program Development (SAP) enable airlines to integrate their business processes and data, resulting in streamlined operations, better decision-making, and reduced costs. Online ticket booking systems and Customer Relationship Management Systems (CRM) software help airlines improve their customer service by providing easy and convenient ways for customers to book flights and manage their travel experience. Furthermore, expanding website functionality, alternative payment options, and flexible discount systems can help airlines attract and retain customers and increase revenue. Overall, the use of these software systems is seen as essential for Western airlines to remain competitive in the fast-paced and rapidly evolving aviation industry. The use of information systems and technologies, despite the difficult situation of Kazakh airlines, can be part of the solution to their problems, even in the face of reduced overall costs [16]. The analysis of the management of information activities was carried out, as a result, internal and external factors influencing it were identified (Table 1). Internal and external factors largely depend on each other, and the company is forced to take this into account when carrying out its activities.

Table 1. Factors affecting the airline company's information activities

Information activities of an airline company		
Innovation	Educational level	Information technology
Share in the structure of the economy of the 3rd and 4th technological structures	Funding of education	Level of investment in intangible assets
Financing of research and development	Dissemination of IT technologies	Number of PCs
Level of investment implementation	Educational level of citizens	Internet access level
Scientific potential of the country	Communication of education with employer companies	Number of Kazakh websites on the Internet
Number of applications for inventions and utility models	Demand for highly qualified specialists	Level of training of specialists in the field of IT
Level of development of technoparks	Level of emigration of specialists abroad	Number of mobile users
Intellectual property protection	Accessibility of higher education	Computerization of educational institutions

Source: compiled by the authors based on data from [15; 17]

For a successful business, the airline must be interested in obtaining reliable information about its internal state and external environment. The efficiency of the use of information resources is determined by the ratio of their active part to the total volume [17]. The specifics of the development of the airline's information resources can be implemented within the framework of creating a single information space.

The specifics of the development of the airline's information resources can be implemented within the framework of creating a single information space. The awareness that the information accumulated in various departments is an important resource that should be available to all users leads to the introduction of a new information policy by Kazakh companies [18]. However, at this stage, a significant number of enterprises are using accounting systems, instead of using more powerful and efficient financial and economic management systems [19, 20]. In addition to its primary functions, the company's financial and economic management system should incorporate a mechanism for managing financial security that encompasses planning, organization, regulation, incentivization, and control [21-25].

III. RESULTS AND DISCUSSION

The use of standard solutions of SAP systems is to effectively manage the company based on its development strategy. This requires a platform that covers all business processes and combines modern management and information technologies. The company gains competitive advantages by implementing such a system, which includes comprehensive control over all business operations, complete transparency of financial statements, simplification of the periodic labor-intensive process of closing the period, cost reduction, and an increase in the company's economic value and investment attractiveness. Thanks to the introduction of ERP systems, it is also possible to improve the work in the investment direction. Thus, most of the investment activities that need to be constantly monitored are reflected in the system as internal orders or projects, which ensure a high level of integration. A characteristic feature of the implementation and application of information systems is their integration into all existing business processes in the

organization. Accordingly, the environment of such a system should take into account the specifics of the company's work when implementing it. In the process of evolution, this type of software has progressed from programs that allow planning the needs for materials and components in a strategic perspective, to programs that allow putting the needs of customers in a key place in the organization.

The main direction of using IT systems by Kazakh airlines is provided in accounting and management accounting, but Western companies pay considerable attention to personnel selection, registration system, mobile applications, and document management. Consequently, airline companies lag significantly behind Western competitors in terms of the level of service. In order to improve the efficiency of airline management, it is necessary to use modern integrated information systems, taking into account the organizational and economic features of the passenger air transportation industry. Corporate information systems are understood as automated management systems of large enterprises with complex organizational and production structure. They allow for solving the problems of both financial and managerial accounting, planning, control, analysis, personnel, automated process control systems, network and telecommunications information transmission systems, Internet technologies in order to provide enterprise managers with comprehensive and sufficient information for decision-making.

However, the existing automated cost accounting and control systems require the integration of various types of accounting and budgeting systems and their adaptation to the specifics of the aviation industry. By effectively controlling data errors in modular number systems, airlines can ensure accurate and reliable data for financial and managerial decision-making [26]. In view of this, the study considers the latest automated information systems. Today in the software market there is a tendency to increase the use of complex automated information systems for enterprise management – the so-called ERP systems. ERP is an organizational strategy for the integration of production and operations, human resource management, financial management, and asset management. It is focused on the continuous balancing and optimization of enterprise resources through a specialized integrated application software package that provides common data and process model for all areas of activity. However, the implementation and support of such large systems require significant costs from the user.

In integrated budget ERP modules, planning is mainly not based on goals, but on the sales plan. The modules determine how to allocate available limited resources in order to fulfill such a sales plan most efficiently, identify reserves, achieve savings, etc. Unlike specialized budgeting systems, it uses a detailed range of budget analysts. At the same time, for budgeting modules, integration with the corporate accounting system is important. Since, when drawing up budgets with an appropriate level of analytics, monitoring of its implementation should be carried out with the same level of detail. Therefore, management accounting for budget analysts should be clearly organized. ERP systems include ready-made specialized modules and extensions for various industries. The main difference between the SAP-integrated information system and other systems is the industry-specific adaptability of this software product, which allows it to be actively used in the aerospace and manufacturing industries, transportation, and the service sector.

The modular principle of the organization allows implementing ERP systems in stages, using one or more functional modules at each stage, as well as choosing only those configurations that are relevant to the organization. The breakdown by modules and their grouping are different, but most of the main suppliers, to effectively manage the enterprise, distinguish the following groups of modules: finance, personnel, and operations. Using the SAP software, the top management of the company receives opportunities for strategic planning and financial and economic forecasting; information for operational planning, and tools for solving everyday tasks. The functionality of the SAP system is used for the purchase of goods and services, inventory management, accounting of cost and fixed assets, investment control, personnel management, and payroll. These operations are reflected in the following modules of the system:

1. Financial Accounting (FI) – a reflection of the airline company's business operations in accounting. Almost all operations performed in other modules are displayed in the FI module in "real-time" mode. The FI functionality provides accounting, control, and analysis of accounts receivable and payable, cash flows, transactions with fixed assets, and the like. Within the module, there are directories that are used in other modules, namely: General Ledger accounts – other modules for most operations initiate automatic "transactions" in the airline's balance sheet; creditors' directory – before inputting a purchase order into the system, it is necessary that the card of the corresponding supplier is entered into the system; debtors' directory – before inputting information about the sale of goods or economic services to any person into the system, it is necessary that the card of the corresponding debtor is entered into the system; fixed assets card – the process of purchasing fixed assets is completed by creating an appropriate inventory card, analyzing which, complete historical information can be obtained.

2. Investment Management (IM) – accounting, control, and analysis of airline investments. All purchases, payments, and movements related to investments are simultaneously reflected in the investment budget. Until the beginning of 2021, the specialists of the Financial Controlling Department plan and input the structure of the investment budget into the SAP system. After the investment budget has been approved, the information is entered into the SAP system in accordance with the projects.

3. Controlling (CO) – accounting, control, and analysis of the current expenses of the airline company in the context of items and structural divisions. The hierarchy of the measurement methodology, as well as the cost items within which the control and analysis are carried out, is determined by the financial controlling department.

4. Materials Management (MM) – material flow management: support for purchasing, storing, moving, and writing off materials and services. The main element of the module is the materials directory. At the level of the material accounting card, the following main characteristics are defined: the name, the unit of measurement, the department responsible for purchasing, the general ledger accounts that will be used to account for transactions with a particular material, and so on.

5. Supplier Relationship Management (SRM) – purchase orders management: creation and approval of purchase orders for goods and services, as well as confirmation of the fact of their receipt.

Among the tasks that should be solved in the airline environment with the help of information systems, there is the problem of improving the efficiency of accounting and management accounting, as well as organizing the procurement process of goods and services. Below, the processes of maintaining accounting records using the CO module and the methods of purchasing operations using the SRM module of the SAP information system will be discussed. In general, the main stages of the procurement process are a purchase request from the airline's divisions, an order to a supplier, a payment invoice from a supplier, payment, and receipt of a product or service. In general, the SRM module of the SAP information system is the optimal automated software product that monitors the implementation of procurement of materials and services at each stage. The use of the SAP SRM system allows for reducing not only the time spent on creating documents and organizing their circulation but also the funds for the maintenance of archival premises and control of all stages of the document life cycle. The processes of maintaining accounting records in the SAP software are implemented mainly through the use of the modules "finance" and "management accounting and reporting". The difference between the modules is that they are recorded at different levels, in particular, the "FI" module is recorded at the level of the balance sheet unit, and the "CO" module - at the level of controlling objects. This is due to the difference between the philosophy of management and financial accounting. The CO module provides cost and profit accounting for the enterprise and includes seven components:

1. Cost accounting by type is the "CO" component, in which the costs incurred during the billing period are recorded. Thus, in this component of the system, it is not the accounting itself that is carried out, but rather the detailed data records that form the basis of cost accounting.

2. Cost accounting by place of origin is used to assign indirect costs to the place of origin to determine the origin of these costs.

3. Process cost accounting is used to analyze business processes that are common to several departments of the company. At the same time, first of all, the tasks of the entire company are taken into account, including the optimization of the flow of business operations.

4. Order cost accounting is used to collect and manage the task-specific data that caused these orders to occur. To ensure that budgets are not exceeded, they can be assigned to measures that are tracked by the system.

5. Product cost control is used to calculate the costs incurred during the production of a product or during the provision of a service. In addition, controlling the cost of the product allows for calculating the minimum price at which the sale of the product will be profitable.

6. Profitability control is used to analyze the company's profit or loss for individual market segments. For each market segment, the system distributes costs in accordance with revenue, and provides a basis for decision-making: for example, calculating the price, determining the partner, determining the conditions, and choosing the sales channel.

7. Profit location control is used to assess the profit or loss of individual, independent units within an enterprise. These units are responsible for the expenses and revenue that they incur. Accounting for the places of profit origin is a special accounting in the SAP system. This means that statistical accounting is performed simultaneously with the main accounting. In addition to the revision of expenses and revenue, for the global gross product, such indicators as return on investment, working capital, and cash flow can be revised.

When using the module "management accounting and reporting", performance indicators for debugging automation of the management accounting system based on SAP ERP can be identified:

– increase in the number of operations per employee;
– increase in the company's turnover;
– decrease in the amount of accounts receivable;
– decrease in the amount of overdue receivables;
– increase in the manageability of the company;
– simplification of planning processes;
– increase in the efficiency and reliability of reporting;
– simplification of the workflow process.

In addition to ERP, an important area of work for airlines is the introduction of CRM systems. In the face of increasing competition for each customer, companies try to provide the most possible enjoyment from interacting with the company, as well as personalized service. The latter involves the analysis of many indicators, in particular, such as the frequency of use of the company's services by certain customers, data on the popularity of flight destinations, and the availability of additional services. Based on the information received, actions related to the promotion of the product are developed. The CRM system is an effective tool for increasing loyalty. However, it should be taken into account that loyalty is formed based on the results of the flight and related actions in general, which information systems are not able to influence. Determining the effectiveness of the use of information systems and technologies by Kazakh airlines is an important step towards finding tools to improve their competitiveness.

Intellectual property protection is a key element for achieving high economic and social development of the state. Protection of intellectual property promotes the use and further development of inventive and creative talents and achievements, supports and preserves the national potential in the field of intellectual activity, and attracts investment. It facilitates the stabilization of the economic state and maintains such an investment climate of the country, for which investors can be confident in the possibility of stable operations in the Kazakh markets. The creation of such a system is of particular importance for the passenger air transportation industry of the Republic of Kazakhstan. One of the most important tasks that should be solved within the framework of the airline's information activities is to ensure effective information exchange with consumers. It is necessary to understand information exchange as an important factor in developing and maintaining airline partnerships with its customers. Instead, the importance of productive interaction with customers is a factor that in the long term can provide a number of competitive advantages for the company in the market and, as a result, lead to an increase in its competitiveness. An example of a set of measures that contribute to improving the information exchange between an enterprise and consumers is the loyalty program. The information exchange of the enterprise should ensure the achievement of the following goals:

1. Establishment of a positive image of the company.
2. Building trusting relationships with customers.
3. Increase in sales of the company's products.
4. Organizing customer feedback.
5. Interaction with some structural divisions in the line of developing methods for attracting new customers.

6. Support for communication with the external environment.

7. Focusing on the positive aspects of the company.

8. Identification of psychophysical characteristics of clients for further development of cooperation with them.

When analyzing the macro environment of the airline in the context of information activities, a PEST analysis (Political, Economic, Social, and Technological Analysis) was conducted. The analysis indicated that the greatest impact of the introduction of information systems in the work of companies is an unfavorable economic situation, frequent changes in the legal framework, and the impact of technical equipment on the process of brand forming, which is due to the peculiarities of using CRM systems. To obtain information on identifying the advantages and disadvantages of the SAP implementation project, a SWOT analysis (Analysis of Strengths, Weaknesses, Opportunities, and Threats) was conducted, which resulted in identifying data problems and ways to solve them. Thus, overcoming problems in the implementation of an information system can be solved through the active support of the management; an increase in the organizational culture of personnel should occur as a result of regular retraining of personnel; the return on investment in the information system should decrease due to the increase in the efficiency of company management.

The formal and conceptual models of IT play an important role in the information activity of an airline. The formal model represents the logical and physical structure of the information system and describes its components, data, processes, and interfaces [27]. The conceptual model, on the other hand, represents the information system from the perspective of its users and their requirements, goals, and tasks [28].

In the context of an airline's information activity, the formal model of IT is reflected in the design and implementation of the information system, including hardware, software, and network components. The formal model also includes the development of databases and interfaces, as well as the implementation of security measures to protect sensitive data. For example, an airline's IT system might include software applications for financial management, inventory control, procurement, customer relationship management, and flight operations. The conceptual model of IT in the context of an airline's information activity refers to the ways in which the system is designed to meet the needs of the users. This includes the development of user interfaces, user manuals, and other documentation to help users understand how to interact with the system. For example, an airline's IT system might include a user-friendly interface that allows employees to easily access information about flight schedules, pricing, and availability, as well as customer information.

The formal and conceptual models of IT in an airline's information activity are used together to ensure the efficiency, reliability and usability of the information system. By designing a system that meets the needs of both the organization and its users, an airline can improve its overall productivity and customer satisfaction, while reducing costs and streamlining operations.

Aéroports de Paris (ADP) is the common name of a group of companies with more than 70 years of experience operating airports in France and in 29 other countries around the world. The main assets in France are the Charles de Gaulle, Orly, and Le Bourget airports. In total, the airports of the entire group carried more than 228 million passengers in 2017. Utilico Emerging Markets is an international investment trust and a global investor in various industries. In the airport industry, the trust owns assets in Southeast Asia, China, and Latin America. On average, Utilico invests up to 7% of its working capital in airports, including Shanghai International Airport in China and Wellington Airport in New Zealand [13]. Children's Investment Fund (CIF) is a hedge fund and one of the main investors in Aeropuertos Españoles y Navegación Aérea (AENA), a Spanish airport operator. In AENA, the fund as a whole owns a share of 6.7%. CIF operates or co-owns 59 airports worldwide. Fraport is German group of companies that owns, operates, and provides services to airports around the world, in particular in Germany, Brazil, India, the United States, etc. The group includes various companies: management, service, engineering, IT, and media. All this facilitates a high level of investment stability and confidence in the customer.

Vinci Airports is a global integrator that designs, finances, builds, and provides day-to-day operations for 45 airports in France and around the world. The founder of this group is the construction company Vinci, which is one of the top 5 construction companies in Europe. All airports of the Vinci group received more than 195 million passengers in 2018, traffic grew by almost 7% compared to the previous year, and revenue for the entire group amounted to EUR 1.6 billion. Vinci constantly builds, reconstructs, and develops airports. The recent "acquisition" is the concession of the capital Nikola Tesla Airport of Serbia, where the French VINCI will commit to invest in development while attracting a loan from the International Finance Corporation (IFC). Ferrovial is a large Spanish company that has been part of the aviation industry since 1998, has more than 20 years of experience in investing, developing, and operating 34 airports around the world. In 2006, the company acquired the British Airports group, which, in particular, includes Heathrow Airport with annual passenger traffic of 84 million passengers. TAV Airports is a Turkish holding, established as a joint venture between Tepe and Akfen Holdings and Airport Consulting Vienna in 1997. TAV Airports is the leading airport operator in Turkey, according to passenger statistics, including transfer passengers. The group also owns airports in Georgia and several airports in the European Union (EU), Asia, and Africa.

Public Sector Pension Investment Board is a Canadian investment company that owns the German company AviAlliance, which, in turn, has a significant share of ownership in key European airports in Budapest, Athens, Dusseldorf, Hamburg, etc. PSP is growing at an annual rate of 19% and has an annual asset income of more than USD 2.3 billion. Corporación América is a group of companies that operates 52 airports, mainly in South America, as well as several airports in the world, including the main airport of Armenia – Zvartnots. This group is the poorest concession operator in the world based on the number of airports under management. In 2017, the group's airports received approximately 77 million passengers, of which 32.8% were international passengers, 55.3% were domestic, and 11.9% were transit passengers. All these management companies create a responsible and efficient business and added value at the airport, which benefits market participants. The capitalization of airports after the transition to the management of an independent operator may increase significantly, and the country's reputation will grow exponentially.

The paper also calculates the recovery period of the renewed investments in JSC Air Astana. Initially, it is worth noting the risk assessment on the example of a specific project for the overhaul of the company's aircraft, the Boeing 757-200 model. The following is a project sensitivity analysis (Table 2).

Thus, the impact of an increase in fixed costs is more significant than the impact of an increase of loan interest. The economic efficiency of the project is calculated:

$$E = \frac{\text{Production results}}{\text{Project implementation costs}} = \frac{342.96}{975.4} = 0.3505 \text{ or } 35.1\ \% \quad (1)$$

Table 2. Sensitivity analysis of the Boeing 757-200 aircraft repair project

Indicators	Indicators		
	Maximum	Basic	Minimum
1. Sensitivity level, %	125	100	75
2. Production volume, mln. KZT	138.4	138.4	138.4
3. Capital investments, mln. KZT	1219.2	975.4	731.574
4. Cost of electricity, KZT/kWh	0.9	0.7	0.6
5. Net profit, mln. KZT	355.126	342.968	330.812
6. Net presentable income NPV, mln. KZT	313.522	362.992	412.462
7. Internal rate of return, %	14.34	15.30	16.51
8. PV Discount, %	11.00	11.00	11.00
9. Discounted payback period, years	7.00	7.00	7.00
10. Expert assessment, the average score	2.9	2.1	0.9

Source: compiled by the authors

The sensitivity analysis showed that in order to ensure positive values that meet the project objectives, it is necessary that the level of capital investment increases by no more than 25% since the internal rate of return decreases with an increase in capital investment. Calculation of the revenue from the project is given in Table 3.

Table 3. Data on investments and revenues of the Boeing 757-200 aircraft overhaul project for 2019-2026, thousands of Kazakh tenges

Investment in the project	Amount
0th month	171
1st month	170
2nd month	171
3rd month	181
4th month	172
5th month	176
6th month	177
Project revenue	
1st month	313
2nd month	323
3rd month	341
4th month	347
5th month	352
6th month	366
7th month	377

Source: compiled by the authors

Table 4 below shows discounted expenses in monetary terms, broken down by month, based on the amount of investment, the duration of the project, and the discount rate.

Table 4. Discounted cash flows for the Boeing 757-200 aircraft overhaul project

Period (month)	Discount rate	Cash flows, ths. KZT
1	0.9028	282.567
2	0.815	263.244
3	0.7358	250.893
4	0.6642	230.484
5	0.5996	211.073
6	0.5413	198.129
7	0.4887	184.241
CF		1620.63

Source: compiled by the authors

Table 4 shows that the cash flows are unevenly distributed and the largest cash flow in the first month of the implementation of the investment project for the overhaul of the aircraft will be KZT 282.567 thousand. The lowest cash flow will be in the 7th month of the implementation of the investment project and will amount to KZT 184.241 thousand. Table 5 below shows the main indicators of the company's investment activity.

Table 5. Investment performance indicators of JSC Air Astana in 2017-2019, %

Indicators	Value			Change, +/-		Regulatory restriction
	31.12. 2017	31.12. 2018	31.12. 2019	2018-2017	2019-2018	
Return on net capital	98.85	123.16	62.34	24.31	-60.82	
Investment coverage ratio	0.4729	0.3855	0.5315	-0.0874	0.146	0.75 or more
Return on fixed assets	3826.31	4988.2	4320.32	1161.89	-667.88	-
Return on capital employed (ROCE)	2025.59	2424.04	2156.82	398.45	-267.22	-

Source: compiled by the authors

The company experienced a 24.31 increase in return on net capital in 2018, which was followed by a decrease of 60.92 in 2019. The investment coverage ratio declined by 0.0874 in 2018 but increased by 0.146 in 2019, although it remains below the norm, indicating a negative outlook on the investment activity of the company. Return on fixed assets increased by 1161.89 in 2018, but decreased by 667.88 in 2019. JSC Air Astana experienced a 398.45 increase in return on investment capital in 2018, but it declined by 267.22 in 2019. The return on the use of invested capital was 1735.07%. These findings suggest that JSC Air Astana's investment activity is inefficient, as the growth of non-current assets by 198.06%, coupled with a 104.33% increase in revenue, suggests that the assets used are less efficient. The purchasing and production activity of the organization is notable in that at the rate of revenue growth (104.33%), inventories grew to a lesser extent (85.27%), which indicates a more efficient use of related assets.

The generalization of the modern understanding of innovations in the high-tech industry determines the strategic mission that innovative development fulfills. The current state of innovative development of the aerospace industry in the Republic of Kazakhstan has certain prerequisites and obstacles to achieving the necessary level of innovative development in the chain and interaction with transnational companies (TNCs)

in this industry. The current state of the world economy shows the stage of development of the large aircraft market in the form of a large-scale structure distributed among the leading TNCs. Notably, after a significant decline in the volume of the passenger aircraft market in 2011-2016, there was an increase in demand for passenger aircraft in 2018. Large corporations that were forced to produce passenger aircraft with the maximum amount of the latest technology and at the same time reduce the price had a significant increase in orders for the production of aircraft in 2018. This state of affairs is a huge opportunity for aircraft manufacturers to increase and consolidate their positions in global markets. The Boeing corporation is one of the ten largest transnational corporations in the world and is the industry leader in aircraft production. With increasing competition, especially with the European company Airbus, the management of the Boeing corporation is constantly looking for new ways and methods to defend its interests in the world market. There is also a constant search for the optimal structure of the corporation.

In addition to the main three structural divisions: civil aircraft industry, military aeronautics, and space companies, Boeing has begun the process of formulating and implementing new tasks for the aerospace industry – it has created a division of Connexion by Boeing SM, which works in the field of communications. It acquired Jeppesen, which became the foundation of the company's information services business. In addition, the newly created division of Boeing Capital Corporation provided an opportunity to increase the focus on the provision of financial services. The competition of the world market takes place in the conditions of a market system, where in order to survive, it is necessary to develop. Within the framework of the global development concept of the Boeing division, the aggravation of competition is driven by new challenges. For example, the search for strategic partners is becoming increasingly relevant to ensure access to markets and resources and optimize costs, the activities of the Boeing corporation take place outside the United States, which increases the economic activity of countries and increases the competitiveness of its products.

According to economists, the cost of doing business in Washington state is one of the highest in the country, which greatly hinders the development of companies, especially those whose activities are of an international scale, like Boeing. The aerospace industry in the United States is competitive with the European one. For 30 years, the leaders of European countries have combined their resources with Airbus, ensuring the unity of the state and industry [24]. They set themselves the task of replacing the Boeing corporation in the market. The leading companies in the European aviation products market are those that have concentrated their intellectual, scientific, technical, and industrial potential in the form of powerful integrated structures [21]. The transformation of the European market has provided an opportunity to combine the latest technologies of several countries to create a more competitive aircraft structure. The process of creating integrated structures in the United States ended in 1997, and in Western Europe – at the completion stage. In 1999, France created the Aerospatiale Matre Daesault out of three companies. This company is equal to the companies of Germany and Great Britain and also entered the top three world manufacturers of rockets, satellites, and helicopters.

In 2000, the French company Aerospatiale Matre Daesault merged with the German Daimler-Benz Aerospace AG (DASA) and the Spanish CASA into the European aerospace company European Aeronautical Defense and Space (EADS). In the future, the creation of a European company that will cover the sector of aviation, space, and electronic technologies with an annual turnover of EUR 45 billion is projected. The structure should include the powerful industrial groups of France: Alcatel, Thales, and divisions of the EADS concern, which are engaged in the production of spacecraft. France controls 12.5% of the global market segment, while the EU controls 32.6% of the global aerospace production. The global aviation market includes the powerful Canadian company Bombardier Aerospace, which is successfully developing due to an effective marketing strategy. It specializes in the production of small aircraft that do not compete with European and American giants, thanks to which the company receives foreign investment. According to this strategy, there were acquisitions of small competitors. India has a single state-owned aircraft corporation, Hindustan Aeronautics Ltd (HAL). Large-scale projects with the states of Central and Eastern Europe and Kazakhstan in the defense and technical sphere are increasingly fragmentary in nature. Therefore, the Kazakh way of cooperation in the aerospace industry is directed to the East, which has a strategic basis.

The annual expenditures of the budget of the Republic of Kazakhstan for research and development work, according to the research institute, amount to no more than USD 5 million. The lack of active international cooperation hinders the development of the Kazakh aviation industrial complex. There are no corporations competing with the world leaders in the Republic of Kazakhstan. A significant part of the enterprises in this sector remain state-owned and cannot be privatized. The consolidation of aviation enterprises into powerful structures, as is the case with all airline complexes in developed countries, should be promising for the development of the aviation industry. The world economy puts forward certain requirements for the Republic of Kazakhstan to the strategic directions of market development for almost all Soviet aerospace enterprises, which are currently not capable at the international level. In this regard, since the beginning of the 21st century, aerospace manufacturers began to modernize these areas of strategic management, and since the 1970s, technoparks have appeared in developed and developing countries. Today, there are more than 600 technoparks in the world. The strategies of the "global" and integration variety were applied and the technoparks were created, that is, innovative catalysts that should contribute to the development of the knowledge-intensive industry sector and attract investors. The enterprises of the aviation industry of the Republic of Kazakhstan have the following competitors:

– aircraft construction: Brazilian company Embraer; Canadian company Bombardier; French-Italian association Avions de Transport Régional (ATR); Swedish concern Svenska Aeroplan Aktiebolaget (SAAB);

– engine-building: the US company Allison; French company Snecma.

It is noted that about 80% of the industry is focused on exports, which sell products mainly in the countries of the Commonwealth of Independent States and far abroad countries. The main purpose of aerospace technology parks in the Republic of Kazakhstan is the introduction of a commercial regime regarding the results of research, bringing products to the production structures of the market. In order to maintain a competitive position in the global market, the aviation states

are strategically focused on the international integration of the aviation industry. It is also necessary to improve the technological level of projects and production with appropriate financial support. Thus, the air carriers of the United States and Western Europe have followed the path of restructuring companies, therefore, today there are powerful corporations Boeing and Airbus, respectively.

IV. CONCLUSIONS

To study the impact of the introduction of information technologies on the company's activities, it is proposed to apply a specialized approach to evaluating the results of the implementation and operation of integrated information systems by determining the direct contribution to the airline's revenue. The next task in the study of the effectiveness of the use of information systems in the company's activities is to calculate the investment assessment of the project for their implementation. It clearly demonstrates the capabilities of such systems as a tool to increase competitiveness and also proves their quick payback period and positive impact on the company. Existing automated cost accounting and control systems require the integration of various types of accounting and budgeting systems and their adaptation to the specifics of the aviation industry. In view of this, the study considers the latest automated information systems. Today in the software market there is a tendency to increase the use of complex automated information systems for enterprise management – the so-called ERP systems. However, the implementation and support of such large systems require significant costs from the user.

Scientific and methodological approaches to the development of the target function of optimizing the budget of the airline company's advertising and information activities are improved, which allows for taking into account the results of such campaigns for the number of respondents covered and adjusting the costs for it depending on the direct results. As a result of the current approach to generating the budget of the information company, it is determined that the best channel in terms of the resulting effect is the airline company's website. This necessitates the study of the needs of potential consumers of the company's services in the features of the web resource in order to increase its efficiency. As a result, the quality function is deployed using the Quality Function Deployment (QFD) methodology, which allows for taking into account the needs of customers and adjusting them based on the available engineering capabilities.

References

[1] S. Meire and B. Derudder, "Virtual interlining within the European airport network: An airfare analysis," *Journal of Air Transport Management*, vol. 94, pp. 102073, 2021. https://doi.org/10.1016/j.jairtraman.2021.102073

[2] Y.-J. Chiu, "Mining patent big data to forecast enterprise performance. Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)," 10923 LNCS, 2018, pp. 687-698. https://doi.org/10.1007/978-3-319-91716-0_54

[3] R. D. Apaza, and L. Popescu, "The way to the future has already started: International Civil Aviation Organization (ICAO) Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocol evolution update," *Proceedings of the AIAA/IEEE Digital Avionics Systems Conference*, September 2018, article number 8569263, 2018. https://doi.org/10.1109/DASC.2018.8569263

[4] K. Button, "Applied economics and understanding trends in air transportation policy," *Transport Policy*, vol. 80, pp. 78-85, 2019. https://doi.org/10.1016/j.tranpol.2019.04.022

[5] R. Merkert and H. Swidan, "Flying with (out) a safety net: Financial hedging in the airline industry," *Transportation Research, Part E: Logistics and Transportation Review*, vol. 127, pp. 206-219, 2019. https://doi.org/10.1016/j.tre.2019.05.012

[6] M. A. H. Al-Fadl, and A. A. A. J. Al Shammari, "The role of cost and benefit techniques in developing supply chain management models in the transportation system (analytical and practical study at Baghdad international airport)," *International Journal of Supply Chain Management*, vol. 8, no. 1, pp. 563-579, 2019.

[7] R. P. de Oliveira, A. V. M. Oliveira, and G. Lohmann, "A network-design analysis of airline business model adaptation in the face of competition and consolidation," *Transportation Science*, vol. 55, no, 2, pp. 532-548, 2021. https://doi.org/10.1287/trsc.2020.1025.

[8] M. Abate, P. Christidis, and A. J. Purwanto, "Government support to airlines in the aftermath of the COVID-19 pandemic," *Journal of Air Transport Management*, vol. 89, pp. 101931, 2020. https://doi.org/10.1016/j.jairtraman.2020.101931

[9] I. Stevenson, and K. Marintseva, "A review of corporate social responsibility assessment and reporting techniques in the aviation industry," *Transportation Research Procedia*, vol. 43, pp. 93-103, 2019. https://doi.org/10.1016/j.trpro.2019.12.023

[10] T. A. Slepneva and N. V. Svishcheva, "Sustainable growth of airline companies: Challenges and prospects assessment," *SHS Web of Conferences. EDP Sciences*, vol. 91, 2021. https://doi.org/10.1051/shsconf/20219101018

[11] N. Barera, L. Sylvain, G. Valléry, and S. Sutter, "Conditions of use and adoption of digital tools: results from a field study on airport reception agents," *Advances in Intelligent Systems and Computing*, vol. 822, pp. 533-538, 2019. https://doi.org/10.1007/978-3-319-96077-7_57

[12] M. Rossi, et al., "Financial structure instability as failure symptom in the aviation industry – The jet airways bankruptcy case," *Proceedings of the 12th Annual Conference of the EuroMed Academy of Business*, 2019, pp. 1047-1057.

[13] A. Borodin, V. Pyatanova, and A. Yashin, "Bankruptcy predictions for air carriers: Global market," *HSE Economic Journal*, vol. 23, no. 3, pp. 418-443, 2019. https://doi.org/10.17323/18138691-2019-23-3-418-443

[14] D. Kim, A. Seth, and R. P. Liem, "Data-enhanced dynamic flight simulations for flight performance analysis," *Aerospace Science and Technology*, vol. 121, pp. 107357, 2022.

[15] S. Lee, H. Kim, and N. Lee "A comparative analysis of financial and operational performance pre – and post-IPO: with a focus on airline companies," *Academy of Accounting and Financial Studies Journal*, vol. 23, no. 3, 2019. https://www.abacademies.org/articles/a-comparative-analysis-of-financial-and-operational-performance-pre--and-postipo-with-a-focus-on-airline-companies-8282.html

[16] P. S. Morrell, "Airline finance," London: Taylor and Francis, 2018. https://doi.org/10.4324/9781315263007

[17] J. Sun, J. M. Hoekstra, and J. Ellerbroek, "OpenAP: An open-source aircraft performance model for air transportation studies and simulations," *Aerospace*, vol. 7, pp. 104, 2020.

[18] C. Lagos, F. Delgado, and M. A. Klapp, "Dynamic optimization for airline maintenance operations," *Transportation Science*, vol. 54, no. 4, pp. 998-1015, 2020. https://doi.org/10.1287/trsc.2020.0984

[19] H. Swidan, and R. Merkert, "The relative effect of operational hedging on airline operating costs," *Transport Policy*, vol. 80, pp. 70-77, 2019. https://doi.org/10.1016/j.tranpol.2019.05.001

[20] M. Renold, J. Kuljanin, and M. Kalić, "The comparison of financial performance of airlines with different business model operated in long-haul market," *Transportation Research Procedia*, vol. 43, pp. 178-187, 2019. https://doi.org/10.1016/j.trpro.2019.12.032

[21] R. Doganis, *Flying off Course: Airline Economics and Marketing*, Routledge, 2019.

[22] M. Dingari, D. M. Reddy, and V. Sumalatha, "Air traffic forecasting using artificial neural networks," *International Journal of Scientific & Technology Research*, vol. 8, no. 10, pp. 556-559, 2019.

[23] E. Alarfaj and S. AlGhowinem, "Forecasting air traveling demand for Saudi Arabia's low cost carriers," *Proceedings of the SAI Intelligent Systems Conference*, Springer, 2018, pp. 1208-1220.

[24] J. Yanto and R. P. Liem, "Cluster-based aircraft fuel estimation model for effective and efficient fuel budgeting on new routes," *Aerospace*, vol. 9, pp. 624, 2022. https://doi.org/10.3390/aerospace9100624

[25] G. Burmester, H. Ma, D. Steinmetz, and S. Hartmannn, "Big data and data analytics in aviation," in: U. Durak, J. Becker, S. Hartmann, N. Voros, (Eds.), *Advances in Aeronautical Informatics*, Springer, Cham, Switzerland, 2018.

[26] V. Krasnobayev, S. Koshman, S. Moroz, V. Kalashnikov, and V. Kalashnikov, "Data errors control in the modular number system based

on the nullification procedure," *International Journal of Computing*, vol. 19, no. 2, pp. 237-246, 2020. https://doi.org/10.47839/ijc.19.2.1767

[27] M. Abbas, R. Rioboo, C.-B. Ben-Yelles, and C. F. Snook, "Formal modeling and verification of UML Activity Diagrams (UAD) with FoCaLiZe", *Journal of Systems Architecture*, vol. 114, 101911, 2021. https://doi.org/10.1016/j.sysarc.2020.101911

[28] F. Bozyiğit, Ö. Aktaş, and D. Kılınç, "Linking software requirements and conceptual models: A systematic literature review," *Engineering Science and Technology, an International Journal*, vol. 24, no. 1, pp. 71-82, 2021. https://doi.org/10.1016/j.jestch.2020.11.006

KAMILLA G. SADVAKASSOVA, *a Doctoral student of the Department of Finance and Accounting, Al-Farabi Kazakh National University. Research areas: Finance, Management, Business Management, Information Technologies.*

AZHAR Z. NURMAGAMBETOVA *CES, PhD, an Associate Professor, Head of the Department of Finance and Accounting, Al-Farabi Kazakh National University. Research areas: Finance, Accounting, Management, Information Technologies.*

GULMIRA E. KASSENOVA *CES, an Acting Associate Professor, Teacher of the Department of Finance and Accounting at the Al-Farabi Kazakh National University. Research areas: Management, Accounting, Computing Science, Finance, Auditing.*

ZHANAR S. KAZBEKOVA, *a Master of Economics, Teacher of the Department of Accounting, Analysis and Audit at the Narxoz University. Research areas: Economy, Finance, International Relations, Management, Accounting.*

DARIYOUSH JAMSHIDI, *PhD, an Associate Professor, Professor of the Department of Management, College of Economics, Management and Information system at University of Nizwa. Research areas: Management, Economics, Business Science, IT.*