

Case Report

How Does an Aerotropolis Integrate? A Case from Zhengzhou Airport Economy Zone

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Abstract: As the modern aviation-oriented business model (aerotropolis), the Airport Economy Zone (AEZ) accumulates capital, technology, workforce, and other production factors. The AEZ always has a large number of infrastructure investments. Still, it has not yet achieved the expected effect in integrating and driving other regional resource endowments in the short term in China. Therefore, governments and AEZ organizations must utilize these investments and create values. This paper demonstrates how the Zhengzhou AEZ (ZAEZ) in China integrates its resources and stakeholders to overcome the remaining issues in its airport stage and gain competitive advantages. We classify three integrations: integrations from contents, including strategic alliance, information sharing, and process coordination; integrations from objectives, including internal integration and external integration; and integrations from objects, including integrating stakeholder, financial resource, and material resource. This paper presents the value creation and competitive advantages of the economy zone from the analysis of different integrations.

Keywords: aerotropolis; Zhengzhou Airport Economy Zone; airport area integrative practices



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1. Introduction

COVID-19 shut down global transportations and activities for a while; airline industries received a hard hit from hardly any flights. City airports have a tough time surviving if they operate in fewer activities; airports with multifunction may have different chances. According to Kasarda [1,2], an aerotropolis differs from traditional city airports. It collects functional departments and facilities around the core airport, making the area an airport city. Large airports such as Hong Kong airport, Singapore airport, and Dubai airport incorporate galleries, shopping malls, SPA shops, cinemas, restaurants, and even gardens to provide passengers with the best service. At the same time, an aerotropolis takes a further step. An aerotropolis integrates kinds of industries to build up a metropolitan sub-region. Its main value proposition is that it can provide enterprises with fast connections with their domestic and global suppliers, customers, and business partners, especially those time-sensitive industries such as high-tech, biomedical, and advanced businesses [3]. An aerotropolis usually has a core airport area, which provides logistics and transportation services. High-end manufacturers and distribution centers surround the airport area to transport products just in time. Other service sectors, such as hotels, outlets, parks, hospitals, and schools, fill in the rest of the aerotropolis (Figure 1).

When an aerotropolis promotes the accumulation of capital, technology, workforce, and other production factors around the airport, it turns into an Airport Economy Zone (AEZ). An AEZ is a new economic growth pole and is increasingly becoming a platform for global survival and development and a virtual node in the international and domestic double cycle. Since AEZ is a relatively new economy mode, there are several challenges. First, the industrial structure needs to be optimized; for example, the Qingdao Airport Economy Zone is dominated by metallurgy, cement, machinery and other industries. These industries are mainly seaport logistics and could not utilize aviation logistics. Second, infrastructures need to be fully developed. For example, due to the low connectivity

between urban area and the airport, the Tianjin Airport Economy Zone could not fully expand and utilize industries in Binhai New Area [4].

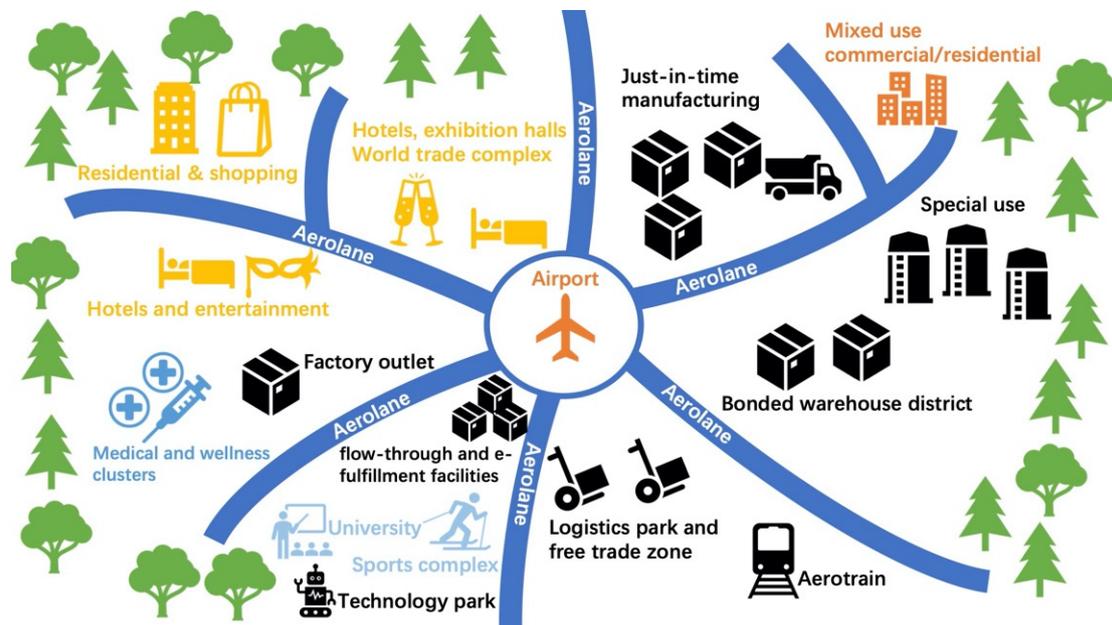


Figure 1. Redraw aerotropolis map. Reprinted with permission from John D. Kasarda. Copyright 2021 John D. Kasarda.

This paper analyzes how the airport economy zone integrates from the Zhengzhou Airport Economy Zone (ZAEZ) in Henan Province, located in Zhengzhou, based on different integration aspects. Zhengzhou is the capital of Henan Province. The major hub of China's national transportation network is its railways, which connect Zhengzhou to Europe (Zhengzhou–Europe International Block train) (Figure 2). The ZAEZ is the first pilot of the comprehensive aviation hub, high-speed railway, inter-city railway, subway, and highway to realize the seamless connection of railway, road, and aviation in China. From the beginning, the mission of the ZAEZ has been to cultivate an aerotropolis and promote the integration of industries and Zhengzhou city [5]. The ZAEZ was given important strategic meanings. It is an international aviation logistics center; aviation economy-led modern industrial base; important portal opening to the outside of inland China; a modern aviation city, and the core growth pole of the Chinese Central Plains Economic Zone. The Henan government has formed a spatial layout of “one core, three areas, and two corridors” (Figure 3) to integrate three major functional sections. One core means the airport core area leading three areas, i.e., north, east, and south. Three regions are a vast urban service area, a trading area of the port trade fair, and a high-end manufacturing cluster. Two corridors are two waterfront landscape corridors relying on the south-to-north water division project and Xiaoqing River and form an X-shaped ecological landscape skeleton [6].

The State Council approved the ZAEZ on 7 March 2013, and it aims to develop the local economy and respond to the national strategy One Silk One Road. This mega project scope expanded during the development phases; the area of the ZAEA extended from 138 KM² in 2007 to 415 KM² in 2013. Larger numbers of industries, government departments, and organizations have become increasingly involved; the great quantity of stakeholders leads to complex management. In such a situation, internal and external resources, stakeholders, and information are necessary.



Figure 2. Railways of Zhengzhou. Reprinted from Zhengzhou Airport Economy Zone.

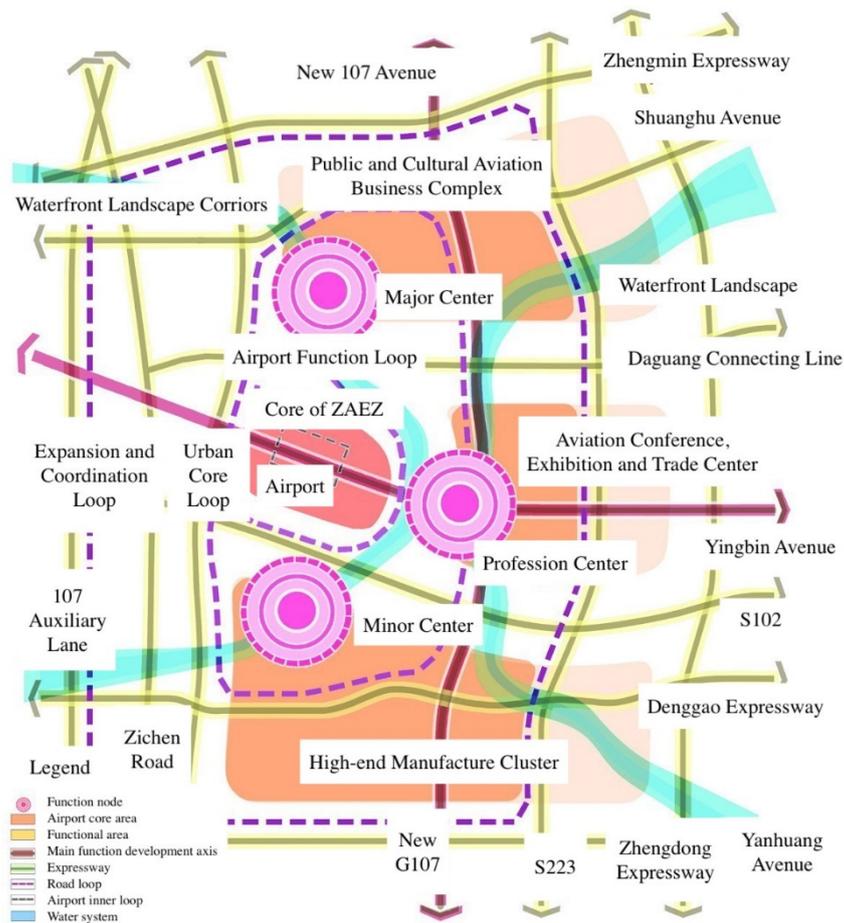


Figure 3. Spatial layout of the ZAEZ. Reprinted from Zhengzhou Airport Economy Zone.

Integration refers to establishing strategic alliances between enterprises and a wide range of stakeholders, coordinating operating procedures, and sharing information resources. It is the unified control of several independent continuous or similar economic or industrial processes [7]. Different integration elements can be roughly divided into two categories: object-based integration, including supply chain integration [8], organizational integration [9], vertical integration [10,11], manufacturing and marketing/sales

decision-making integration [12], senior management team behavior integration, etc. [13]. The second is content-based integration, including knowledge integration [14,15], organizational IT system integration [16,17], process coordination [18], etc. Further, some studies also divide integration across two dimensions simultaneously. For example, from the perspective of integration objects, Fabbe-Costes and Jahre (2008) [19] divide integration into integrating core firms and customers and suppliers, integrating activities, technology, systems, organization, and structure. Similarly, Alfalla-Luque et al. (2013) [20] systematically combed the integration literature. They found that the integration elements mainly cover internal, supplier, and customer integration, the integration of processes such as new product development and quality management, and the integration of information flow and logistics. Based on the previous literature, they proposed a new integration framework. They believe that core enterprises, suppliers, and customers need to build close integrated management around the three elements of information sharing, resource sharing, and organizational relationship coordination.

Based on different supply chain situations, some studies classify integrations into internal integration and external integration, and point out internal integration is the basis of external integration. Internal integration establishes essential technical and non-technical connections through various cross-departmental cooperation. These connections allow the company to convert better and use external knowledge [21]. Ultimately, internal integration and external integration work together to improve the company's global procurement capabilities [22], rapid response capabilities [23], and adaptability [24]. Some studies classify from the integration of content and believe that information sharing, strategic alliances, and process coordination have a mutual influence. The coordination of processes between enterprises and the formation of strategic alliances provide information sharing with a connection between physical and relational dimensions [25]. Information sharing, in turn, provides resistance to integrated related practices [26].

This paper will point out problems and issues that Xinzheng International Airport (CGO) had before the ZAEZ was established and analyze how different stakeholders integrate and how integration creates values for the ZAEZ in logistics and supply chains. Based on the previous literature review of integration, this paper classifies integration mainly from three dimensions: integration from contents, objectives, and objects. Integration from contents includes strategic alliance, information sharing, and process coordination. Integration from objectives includes internal integration and external integration. Integration from objects includes the integration of stakeholders, financial resources, and material resources (Figure 4).

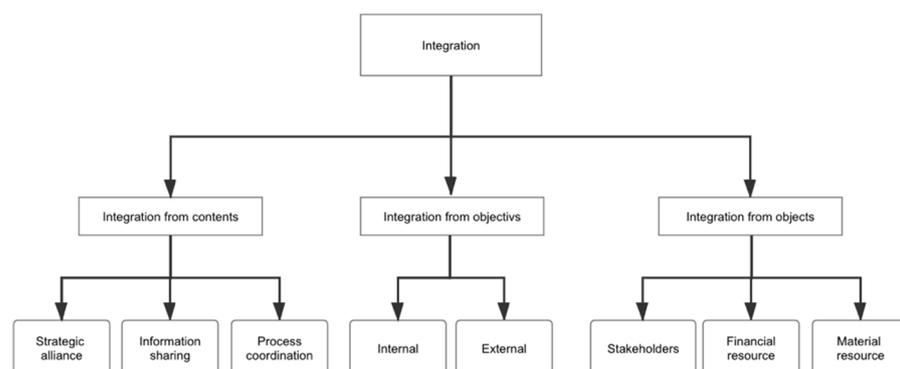


Figure 4. Integration dimensions.

2. Literature Review

The aerotropolis was developed by John D. Kasarda [1–3]; it is based on traditional airport cities' function with clusters of aviation-related industries and outlying corridors. It is also known as the airport economy zone (AEZ) in China. It relies on airport trans-

portation functions and location advantages. The airport is the geographic center, based on aviation-related industries such as air transportation, logistics services, time-sensitive, and technology-intensive industries as the leading factor in allocating regional resources [4,27]. In Brilha and Nobre [28]’s research, they summarized an aeropolis concept from an entrepreneurial perspective, such as opportunity focus, rapid innovation, and creating customer appeal; from a managerial perspective, such as strategic focus, organizational synergy, managing resources, managing relationships, and systematic value management to create new values. In this paper, we provide an integration perspective to demonstrate value creations from the ZAEZ. In traditional airport cities, researchers explored the relationship between high-speed rail and air transportation [29,30] and concluded the impact of integrating these two transportations on the aviation service. Other scholars investigated air and high-speed rail service integration from qualitative [31] or quantitative [32] methods from the Shanghai Hongqiao hub and Beijing–Guangzhou corridor. This paper investigates integrations from internal to external, from objects to objectives, by a case study.

3. Research Design

To start our case analysis, we collected data from journal articles, government reports, newspaper, four–five phone interviews, and others. The overall research scope includes Xinzheng International Airport (CGO), the Zhengzhou Airport Economy Zone (ZAEZ) and its related government departments and state-owned-enterprises. We described the issues of the CGO period based on articles, news and phone interviews from cross-border enterprisers, passengers and one civil servant. Then, we analyzed how the ZAEZ integrates from different aspects and solves issues CGO leaves based on government reports, news and articles. Due to the data limitation, this case study tends to be more conceptual than quantitative.

4. Issues of the Xinzheng International Airport (CGO) Period

4.1. Underdeveloped Multimodal Transportation

The core mode of multimodal transportation in CGO mainly relies on the joint operation of multiple transportations such as railways, highways, and civil aviation. Although Henan is located in the center of China, and various transportation constructions are relatively mature, these transportations belong to different departments. Many transportation hubs are operated independently and not connected smoothly and efficiently, which leads to insufficient logistics information sharing. For example, Zhengzhou is the center of the transportation hub; railway stations and bus stations are mainly located in the urban area. In contrast, CGO, an aviation hub, is located in Xinzheng, a county-level city. These two locations are far apart and lack fast and efficient docking:

“ . . . The public transportation around CGO is not perfect. Many passengers in Zhengzhou city or surrounding areas need to transfer to the airport shuttle at the railway station...” (Passenger that travelled from CGO).

The lack of supporting suburban railways and high-speed rail express logistics bases leads to the inability to achieve zero transfers between rapid rail and aviation. The development of multimodal transportation at the airport has small coverage and capacity.

4.2. Information Sharing

To improve the user’s satisfaction, various airlines and freight forwarding companies have introduced special cargo information systems, but they have not brought the cargo owners’ convenience as envisaged. Different standards have caused the problems of independence between systems and incompatibility of services, resulting in the inability to realize the multi-channel sharing of logistics information and cargo owners’ inability to query information across platforms, which significantly reduces the effectiveness in choosing transportation:

“... It is hard for us to find a consultant or department to figure out standards of different transportations... guidelines are confused due to kinds of versions... ” (Passenger that travelled from CGO).

The lack of a unified information sharing platform causes the price, flight, and space information provided by airlines to freight forwarding companies to be ambiguous and makes it difficult for logistics systems such as water transportation and land transportation.

4.3. Air Transportation Network

CGO has 34 all-cargo routes (including 29 international routes) and 187 passenger routes (including 26 international routes) [27]. The number of freight routes is lower than the number of passenger routes; some cargoes in Henan have to resort and transit from major airports such as Shanghai, Guangzhou, and Beijing to reach their destinations. These weak logistics networks weaken the competitive advantages and service radiation of CGO. Competition in the domestic airport market is fierce. At present, there are 20 airports with a cargo throughput of more than ten million, of which Beijing, Shanghai, and Guangzhou account for more than half of the cargo. Additionally, the governments in the central and western regions with a good airport foundation have also introduced various supporting policies to promote their developments. CGO needs to expand its airlines and routes to meet the increasing demand in the future:

“... The current situation of CGO is that its transportation resources are highly single, mainly relying on the European market. It cannot cover emerging markets such as South America, Africa, South Asia, and the Middle East... ” (Civil servant from the traffic department).

“... Henan lack local airlines and it leads to the loss of passengers and international airlines... limited international passengers were directed to the airline headquarters for transit... ” (Passenger that travelled from CGO).

4.4. Logistics Service

The logistics network involves different transportations and routes; each part is prone to conflicts of interest and the evasion of responsibilities. CGO finds it hard to provide an efficient and fast service experience for the combination logistics of road, aviation, and railway. During the airport's development and construction, real-time and accurate logistics information requirements were relatively strict. It is necessary for service providers to analyze the types of logistics information according to the specific conditions and help firms select the appropriate transportations. CGO's comprehensive logistics service capabilities are not strong. There is a big gap in the logistics operation process and the efficiency of internationally renowned airports. The logistics service chain in CGO is relatively weak. The cooperation between logistics companies and related functional departments is not skilled enough to meet customers' needs. Each part is independent and operates independently, which leads to inefficient service:

“... There is no large local freight forwarding company in Henan, which makes the space resource scattered and the market chaotic, especially not conducive to cross-company capacity allocation.” (Manager of a cross-border company).

Based on the issues described above, the next three sections analyze how the ZAEZ integrates its stakeholders, financial resources, and material resources from internal to external to solve these problems. Specifically, from kinds of integrations, the ZAEZ speeds up the construction of aviation logistics supporting industries and facilities, improves the extension of aviation logistics' value-added services, and attracts well-known air cargo companies and logistics companies to settle in. It promotes an efficient and seamless multi-modal transportation and low-carbon transportation system, cultivates advanced business forms through industrial clusters and integrates a supply chain logistics information system platform to create value for the ZAEZ's supply chain partners and customers.

5. Integration from Contents

5.1. Strategic Alliance

The strategic alliance combines conjoined thinking, decision-making, and a synchronized plan, focusing on the long-term symbiotic effect among firms [21]. Strategic alliance provides fast and flexible ways to achieve market access, expand the market size, increase economies of scale, develop capacity, and gain cross-business synergy. Thereby it increases firms' competitive advantage through collaboration [28]. Henan provincial government and industries have mutual goals, which make them an alliance. The government aims to attract investments, construct this project, drive Henan Province open to the world, and optimize its business environment. By integrating the economy zone, Henan could accelerate the formation of the integrated effect and comprehensive advantages of "hub + port + bonded + industrial base"; finally, the ZAEZ could be the model of economy zones [5].

Industries could benefit from policies and state incentives and supports, such as policy support (tax and new customs declaration), land support (kinds of industrial parks), financial aid (such as cash rewards for enterprises on the resumption of work and production during COVID-19). Further, the ZAEZ provides the logistics aviation industry, high-end manufacturing industry, and modern service industry. Industries could build up their supply chain network among the areas to save cost and time. Industrial support platforms such as the intelligent terminal export rebate capital pool, the incubator service platform for science and technology enterprises, the public resource exchange center, and the public service platform for smartphone R&D and tests enable industries to operate flexibly.

The ZAEZ is also a China (Henan) pilot free trade zone, a demonstration base for entrepreneurship and innovation, and a pilot of RMB innovation. These national innovation strategic platforms provide industries with a better business environment and convenience [33]. Overall, industries and the government build a strategic alliance. The ZAEZ significantly improves urban construction quality and strives to create a clean and honest political environment for entrepreneurs and a market-oriented, legalized, and convenient business environment. High-end manufacturer clusters, in turn, bring more job opportunities and taxations. For instance, Zhengzhou obtained pharmaceutical import port permission at the end of 2019, 10 biomedical manufacturers signed up in a biomedical industry park two months later, and the project of the first national large-scale production base for Class I innovative drugs started in December 2020, which invests US dollars 230 million and covers 200 acres of land. In this case, biomedical industries and the government have mutual benefits from pharmaceutical import port permission. The government is committing industries to build an integrated full-process public service platform and gradually form a 1.53 billion-USD-level biological pharmaceutical industry cluster [34].

5.2. Information Sharing

Information sharing along the supply chain means downstream and upstream partners share information inter- and intra-organization cooperatively to align strategic plans, resources positions, and actions [35]. Partners improve performances during information exchange, synchronization, and integration [36]. In the ZAEZ, the government has built up a public online opinion platform to communicate better with citizens and manufacturers and the ZAEZ smart city big data center. These platforms support smart city applications. Through the integration and utilization of hardware resources and raw data in smart city data centers, the ZAEZ achieves information sharing and business collaboration with government departments, industries, organizations, and citizens.

Further, the Henan government integrates manufacturers stocking information in advance so that the ZAEZ and Zhengzhou customs can prioritize the inspection of cross-border e-commerce export goods and ensure rapid customs clearance. The ZAEZ establishes a daily reporting mechanism, accomplishes information sharing, implements economy zone work, and keeps every department on the same page using information systems and tools. The ZAEZ also upgrades related systems to complete the second-level

data exchange nodes. The free trade zone can connect with China International Trade and corporate's ERP systems with other provinces and collects and shares corporate credit information to avoid potential risk. Following the corporate network data upgrade adjustment notice, the ZAEZ guides manufacturers to carry out system docking work, which allows them to enjoy more cross-border e-commerce customs clearance, fiscal and taxation, and other preferential treatment policies [37].

To decrease logistics cost, the ZAEZ integrates several departments inside and outside Henan, such as the provincial department of transportation, development, and reform commission, market supervision bureau, Zhengzhou customs, the China railway Zhengzhou bureau group, and the China railway Wuhan bureau group, to establish a public information service platform for multimodal transport in Henan Province. It aims to expand information resources among departments, regions, and methods by the end of 2021. This integrated platform aims to support the construction of the "Internet +" truck and cargo trading platform and network freight platform, etc., to promote the precise docking and effective integration of logistics supply and demand and transportation resources [33]. Further, the first domestic-avionics-cargo information service platform was unveiled at CGO on 31 December 2020 [38] to improve the logistics service.

Strengthening the collection and sharing of business information related to enterprises is also important. To involve enterprises' operations with the centralized sharing of government information, government departments promptly collect information on enterprise registration, business licenses, order fulfillment, law enforcement inspections, administrative penalties, and other information into supportive platforms, such as the national integrated online government service platform, the national credit information sharing platform, and the national enterprise-credit-information public system. Government departments would not ask enterprises to provide information that can be obtained through information sharing anymore. For government vertical management business information systems, departments integrate manufacturer information and demand the prompt introduction of convenient and feasible business options and share useful plans and incentives to the ZAEZ enterprises and organizations [39].

5.3. Process Coordination

Process coordination means the coordination and collaboration between supply chain partners to solve possible conflicts and develop performance [40]. Both parties participate in others' process flow, such as produce and management; these interactive behaviors are based on physical investments and human involvements [41]. Since most manufacturers located in the ZAEZ are cross-border trades, the Henan government implements two customs clearance modes to help manufacturers' speedy clearance and to reduce tariffs. The ZAEZ is the first to use the 9710/9810 cross-border e-commerce tax filing mode for B2C enterprises' export. By using the 9710/9810 mode, customs clearance can be achieved in a single window [33]. Small and medium sellers save manpower and material resources to complete the process and forums. For import, the Henan Bonded Group, a state-controlled venture, innovatively proposed a customs clearance supervision model of "e-commerce + bonded center + postal supervision", assigned the "1210" supervision code by the General Administration of Customs [42]. The 1210 mode makes clearance efficiency reach 1000 orders per second and creates a new O2O on-site pickup retail model. These modes save the manufacturers' cost and time. Manufacturers have clear and convenient guidelines to follow and obey, and in turn, they help the government standardize customs management and provide rich custom statistics to be recorded and analyzed.

Further, the ZAEZ implements a "one-stop review and approval plus parallel approval" system for new projects procedure, a considerate service system, and a subcontract responsibility system to coordinately solve the problems existing in the project and accelerate project construction [29]. These systems coordinate and integrate different government departments and organizations to provide a better business environment for enterprises. Enterprises receive help, training, and subsidies from governments; governments are aware

of the industries' demand and coordinate the overall operation process. Different parties interact from the start of a new project; they get familiar with each other and enhance their common language, and reduce unnecessary conflicts because of interests.

6. Integration from Objectives

Integration is the degree of supply chain members who coordinate and cooperates with each other to effectively and efficiently manage flows of products, information, money, and decisions to maximize value to customers and themselves [43]. In this section, integration is divided into internal and external integration.

6.1. Internal Integration

Internal integration refers to the manufacturer that coordinates its different departments and functional groups to synchronize organizational strategies and practices to processes [21,43]. Internal integration involves information sharing or working together with cross-functional groups to improve the process or develop new products [44] to fulfill customers' demands and maximize manufacturers' value. In Kasarda's framework, airport planning, business site planning, and urban planning integrate to build an aerotropolis. In the ZAEZ, the government integrates its vertical and horizontal functional departments first to support the resources and information integration of "one core, three areas, and two corridors". The city hall and state government integrate some department affairs first to reduce complexity and redundancy procedures, decrease the level of paper working, and turn the government into an eGovernment and iGovernment.

To thoroughly implement the provincial and municipal work deployment, coordinate the promotion of the construction of major projects in the ZAEZ, and ensure the smooth completion of the annual objectives and tasks, the ZAEZ Key Project Construction Leading Group was formed [45]. There are three subgroups: investment promotion office, joint review and approval group, and supervision group. These cross-functional departments integrate and establish a joint promotion work mechanism. The leading group takes adequate measures to ensure the completion of critical projects, collaborative review and approval, investment objectives and tasks, and the sufficient growth of investment in the region.

Besides, the city hall states that it will speed up the promotion of "Internet + government services", and establish an integrated information interconnection and sharing exchange system of provinces, cities and districts within the ZAEZ [46] to break information islands and achieve information interconnection and openness. The government service network, as the only business acceptance platform, integrates on-site queuing, service evaluation, item acceptance, online approval, and license information sharing. Therefore, the ZAEZ could achieve one-chain supervision, promote business standardization with informatization, promote the integration of physical halls and online service halls, and increase the proportion of online services.

6.2. External Integration

In contrast to internal integration, external integration focuses on manufacturers' supply chain partners, such as supplier integrations (system integration and process integration) and customer integrations [18]. It aims to synchronize and collaborate upstream and downstream strategies, practices, and processes with core competitive supply chain partners to maximize its supply chain value [47]. For the ZAEZ, it mainly integrates industries that are located inside and in other economy zones and aerotropolis' to share information and enhance communication with countries belonging to one silk one road [45].

The ZAEZ integrates the resources from the Zhengzhou Free Trade Zone to support its comprehensive bonded zone. Kaifeng focuses on building a service trade innovation development zone and a pioneering area for cultural and creative industries. The Henan provincial government and the ZAEZ coordinates customs, foreign exchange, and taxation departments to delegate the approval of export tax rebates (exemptions) for foreign

trade enterprises. It establishes a dual and multidimensional evaluation system for import and export enterprises in the ZAEZ, and strengthens customs clearance services, and helps enterprises import and export epidemic prevention materials throughout the process. Luoyang focuses on building an international intelligent manufacturing cooperation demonstration area [48]. By integrating these three areas, departments of finance, transportation, justice, commerce, and finance supervision of Henan Province coordinate work process, reduce duplicated procedures and promote innovations of the China Railway Express, such as the “one-bill-for-all” system and “door-to-door” for international multimodal transportation, digital express and integrated transportation and trade [49].

Based on the integrated governments and functional areas, manufacturers, enterprises, and organizations form industry clusters. The Zhengzhou area has developed a development pattern of leading industries such as modern logistics, cross-border e-commerce, automobile manufacturing, modern finance, and business exhibitions. The automobile and parts industry cluster achieved an output value of nearly USD 1.53 billion in 2019 [49]. The Luoyang area’s equipment manufacturing industry has accelerated its development and formed seven industrial clusters, including complete equipment, robots, intelligent equipment, photoelectric connectors and electronic components, special equipment, bearings, automotive engineering design, and manufacturing. It provides more than 50% of the output value, employments, and tax for Luoyang [48].

Beyond integrations inside the province, the ZAEZ joined the national collaboration platform, which has 47 aerotropolises and free trade zones all over the country. This platform shares institutional innovation, policies, cases, projects, and experts. It evaluates and shares more than 35 outstanding innovation cases and cooperates with ten well-known think tanks, including the Credit Research Institute of the Ministry of Commerce and the Institute of International Trade and Economic Cooperation of the Ministry of Commerce, to conduct online and offline exchanges and seminars to promote policy breakthroughs jointly [50].

7. Integrations from Objects

7.1. Integration of Stakeholder

Due to the megascope of the ZAEZ, complex and multiple stakeholders interact with each other. To coordinate the work process and speed up the livability and urbanization of the ZAEZ, several alliance and teams were built, such as a specific ZAEZ government team, cooperative alliance, real estate alliance, and participant of education and healthcare.

Government departments integrate from vertical to horizontal; specific administration such as the ZAEZ Key Project Construction Leading Group was formed from cross-functional departments from city hall and provincial government. The provincial government also established the ZAEZ management committee and entrusted the city hall to manage it. Further, to be more flexible and increase work autonomy and discretion, the Standing Committee of the Henan Provincial People’s Congress announced its official website, stating that the “regulations on the Zhengzhou Airport Economy Zone had been reviewed and approved at the 21st meeting of the Henan Provincial People’s Congress on 28 November 2020. It will take effect on 1 March 2021.” According to the “regulations”, the ZAEZ exercises the power of the economic and social management of the provincial government and the power of special management granted by the provincial government and will be more flexible in terms of personnel appointments.

Besides the government departments integration, the ZAEZ also integrates international organizations to expand its influence and globalization, such as the United Nations Industrial Development Organization (UNIDO), a specialized agency of the United Nations system to promote sustainable industrial development and international industrial cooperation. UNIDO mainly engages in core businesses such as poverty reduction, trade capacity building, energy, and environment; it aims to promote the economy through sustainable and inclusive industrial development. The Northern Regional Collaboration Center (NRCC) is the first resident agency officially established by the UNIDO in Henan

Province. Its official landing will further promote the landing and incubation of overseas investment and technology in Zhengzhou. The NRCC promotes the conversion of kinetic energy and the overall upgrade of the industry in Zhengzhou and even the northern region to enhance the level of Zhengzhou's openness to the world. It also promotes high-quality economic development and builds a new development in services that contribute to the pattern of the economy zone [51].

Further, the ZEAZ also sets up policies to integrate individuals to convert external knowledge into intelligent assets, such as innovative overseas talent exchange policies and mechanisms, a green channel for introducing overseas talents, and interaction with experts in all industries. For example, the ZAEZ held regular industry–university–research matchmaking conferences to build an exchange and cooperation platform for enterprises and universities, expand the field and space of school–enterprise cooperation, and promote more outstanding scientific research results. It encourages industry–university–research cooperation projects and high-tech talents to settle in the economy zone to enhance innovative abilities of industries to achieve the goal of multi-party cooperation [52]. The ZAEZ also supports Zhengzhou Xinggang International Airport (CGO) in expanding air traffic rights and establishing a cargo alliance with international hub airports and strengthens customs and regional cooperation with countries along the one belt one road by promoting the construction of aviation and transportation.

7.2. Integration of Financial Resource

The ZAEZ mainly integrates its financial resources from three areas: policy support, investing promotion and state-own-company. For policy support, the ZAEZ issued several regulations of finance and taxation, and investment and trade to facilitate enterprise and operation process, such as provincial and municipal finance should increase investment in transfer payments in the economy zone and support the development of public utilities and infrastructure construction in the experimental zone [53].

Besides, the ZAEZ promotes 35 projects signed in 2020 with a total of USD 7.1 billion. These projects include electronic information, biomedicine, energy conservation and environmental protection, equipment manufacturing, cultural and creative tourism, scientific and technological services, modern logistics, health care, and other fields. There are three investment projects for Fortune 500 companies in the world, two investment projects for Fortune 500 companies in China, 14 projects with a contract value of more than USD 15 million, 15 manufacturing projects with a contract value of USD 2.4 billion, and 20 service industry projects with a contract value of USD 4.7 billion [54]. These projects activate the flow of finance in the ZAEZ. They also provide a huge number of employments and spur related industries on involvement.

The ZAEZ established a state-owned-enterprise named Zhengzhou Airport Xinggang Investment Group Co., Ltd. (Xinggang Investment) on 9 October 2012. It is under the management committee of ZAEZ. Till 31 October 2020, Xinggang Investment has a paid-in capital of USD 2.45 billion. It has 145 wholly owned and participating holding companies and branches, with total consolidated assets of USD 30.6 billion and net assets of USD 8.95 billion [55]. Xinggang Investment continued to optimize the asset structure and gradually formed a business pattern of the coordinated development of seven specialized subgroups, including policy construction, finance, operating real estate, industrial parks, public utilities, smart cities, and culture. The policy construction subgroup is responsible for primary land development, resettlement housing construction, and other businesses. The financial subgroup is responsible for the investment and operation of financial and financial services and the financing business of the Xinggang Investment. The operating real estate subgroup is responsible for real estate development, house leasing, and other businesses. The industrial park subgroup is responsible for developing and operating industrial parks, property management, and other businesses. The public utility subgroup is responsible for the investment, construction, and operation of public utility projects. The smart city subgroup is responsible for consulting, planning, design, infrastructure

construction, and smart cities' operation. The cultural subgroup is responsible for the investment and operation of cultural business and the corporate promotion of Xinggang Investment. Based on the multiple subgroups, Xinggang Investment is in charge of multiple mega projects in the ZAEZ, such as the Zhengzhou Garden Expo, the ZAEZ Hedong Shanty Town Project, the Henan Provincial Staff Recreation and Sports Center, the ZAEZ Public Health Comprehensive Service Center, and the ZAEZ Nursing Home [56].

7.3. Integration of Material Resource

The ZAEZ introduced an integrated information system, such as various platforms, to provide information support, and issued several policies to encourage downstream and upstream industries to form whole-chain services. For example, the ZAEZ published 13 industries that could be settled first, such as the IT of next-generation, high-end equipment manufacturing, new materials, biology, new energy, and new energy vehicles, digital innovations, aviation logistics, aviation operation and related service, e-business, digital aviation, cultural tourism business, the headquarters of top enterprises and organizations, and other related services [57]. These industries and their related service enterprises complete the industry clusters.

Further, the city hall supports the economy area in prioritizing the construction of consulate areas, international communities and international trade; the layout of public service resources, such as international hospitals and schools, and talent exchange centers for the ZAEZ's needs.

8. Summary

The integration of intelligent technology helps the ZAEZ form digital intelligence capabilities, solve complex problems, support end-to-end transactions. Information sharing and IT integration avoid the problem of "data islands" among each stakeholder, increase data connectivity and knowledge emergence, and maximize smart technology's value. Overall, these integrations support the coordination and value creation of multiple entities and processes in the economy zone and solved poor information sharing issues in the CGO period. The ZAEZ integrates aviation and land transportation enterprises to gather logistics resources to promote the upstream and downstream of the economy zone's total supply chain and solve the inconvenience of underdevelopment multimode transportation. Integrated logistics achieve the seamless connection of production, communication, sales and gain competitive advantages. Moreover, they improve the logistics service for buyers and suppliers. The ZAEZ integrates multiple suppliers to effectively manage them under complex networks, improve the supply chain's visibility, and help the ZAEZ achieve production and sales coordination. Further, the ZAEZ integrates customers to create various industry clusters (upstream and downstream). Customer integration helps the ZAEZ attract, respond to and retain customers through the entire process of precision marketing, after-sales service, and community mechanisms to participate in the value creation activities deeply.

By integrating horizontal and vertical departments of provincial and city governments from information systems to administrative processes, the ZAEZ creates a better business environment for manufacturers, enterprises, and organizations to join. By 2020, more than 170 schools (including kindergartens, primary schools, middle schools, high schools, colleges, and universities), three academician workstations, and a total of 12 hospitals, health centers, and community health service centers with 1779 beds available, have been built, which initial forms a 15-min medical service circle. A total of 18,900 new urban jobs have been created [58]. The ZAEZ provides financial, political, and physical support for industries to take part. There are 103 provincial and municipal R&D platforms, 55 high-tech enterprises, and 202 high-tech SMEs joined the ZAEZ because of the complete supply chain clusters and its aviation hub position [59].

Further, by integrating with countries of one silk one road, the total import and export value of the ZAEZ was USD 53.05 billion in 2019, and there was a total of 523,000

tons of cargo and mail throughput in 2020 [58]. As a mega project with complicated stakeholders, such as governments, organizations, citizens, enterprises, and manufacturers, it requires integration and coordination from information, the process to resources, from internal to external, to achieve its mission. The ZAEZ takes a great effort to integrate multiple stakeholders and resources to manage such a huge supplier network and form a visual and traceable supply chain management capability. From the collaborative work process, management, industries, and government departments sharing accurate and timely transmit demand information, and real-time demand, inventory, and logistics information is visualized.

Overall, an aerotropolis shortens the geographical distance among cities in terms of time. It provides great convenience for the flow of commodities, materials, funds, information, talents, and technology. An aerotropolis also has radiating effects on the surrounding areas, such as promoting their economic and social prosperity. The case of the ZAEZ demonstrates how an aerotropolis operates and improves from integration perspectives. It provides managerial experience for other aerotropolis' in several aspects. For example, developing international airport construction and building comprehensive transportation hubs from external resource integration and building strategic alliance among governments and industries; developing aviation logistics to build a regional center logistics by integrating stakeholders and increasing information to improve overall logistics service; depending on the aerotropolis industry structure to form industry clusters. Specifically, the ZAEZ provides experience for those inland cities with underdeveloped aviation that could develop multimodal transportation such as highways and rails to support its aviation logistics since passengers and goods need to take land transportation before entering the airport. If the land transportation is underdeveloped, no matter how fast the plane is and how many airlines there are, it is still not that efficient.

Further, an aerotropolis or airport economy zone is a driver of the regional economy. It is a physical platform that gathers resources worldwide, and it becomes a trend in the world. Memphis International Airport (a benchmark of the ZAEZ) is the core aviation hub of FedEx Express, Shannon Airport is focused on the aviation manufacturing industry, Frankfurt Airport focuses on the development of finance and exhibition industries, and Incheon Airport develops an airport economy zone that integrates residential, commercial, leisure, and education functions. The ZAEZ is primarily a comprehensive cargo-oriented airport economy zone since it does not have strong competitive advantages in the tourism and aviation-related industry, which indicates the importance of the right positioning of the airport economy zone. Finally, the ZAEZ's experience shows that strong support at the municipal, provincial, and central government levels is instrumental for aerotropolis development success. The ZAEZ would not be what it is today without this support. Chinese government agencies at all three levels established the ZAEZ framework and strategy with the assistance of aerotropolis experts. These government bodies then played key roles in modernizing the airport (CGO), expanding its air routes, substantially upgrading surface connectivity, as well attracting private sector investment to the ZAEZ that fueled its remarkable growth. The integrative practices of the ZAEZ substantially contributed to its economic outcomes helping make it one of the most successful aerotropolises in China and the world.

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