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The role and position of Airport City in the Supply Chain

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Abstract

In the past, it was enough for the airport to have a runway and a modest terminal. The development of air traffic has also increased customer requirements (passengers, airlines, etc.), which has affected the need for airport infrastructure development. Throughout the world, passenger terminals have been built, many of which, according to architectural solutions, represent works of art. The design and functionality are tailored in such a way as to enable longer stay and meet the requirements of passengers and other users. Content and concept offer solutions that airport operators provide for additional revenue. One part of the content and service is offered in passenger terminal buildings, while the other part is provided outside them, whether in or outside the airport. Part of this content is offered by Airport City (AC). AC phenomenon represents the integration of infrastructure, superstructures, information and operations. It represents a part of the Supply Chain (SC) and usually includes facilities such as: passenger terminals, runways and other airport activities such as: ground handling, logistics, office space, shops, hotels, etc. In this paper, authors use a method of systems theory, a modeling method and a comparative method as a general and some specific scientific methods of cognition, to researching the problem to which different AC models and their structure can contribute to the optimal SC flow as its essential part and bring the results of the AC phenomenon as a part of the SC.

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1. Introduction

The Supply Chain (SC) phenomenon definition is complex. It largely depends on the aspect of approaching this phenomenon. If SC is accessed in the traditional approach, then one-way flow of goods is discussed. Modern approach of the SC examines the flow of goods, but also services and information. It's a dynamic phenomenon. Traditional logistics is primarily based on warehousing and transport activities. Modern logistics approaches include information flow among all SC participants. When it comes to SC, it is necessary to talk about the flow of goods and information among SC participants, such as suppliers of raw materials, transport organizations, product makers or service providers, product distributors, product chains that allow the product to reach the end user and consume it. SC also makes certain activities after delivery to the customer as end users.

The concept of the SC, which first appeared in the early 1990s, has been the focus of growing research interest, as

the possibility of providing integrated Supply Chain Management (SCM) can reduce the risk of unexpected/undesirable events throughout the network, and can markedly improve profit for all parties involved (Beamon, 1998). Due to the present economic condition and globalization, the SCs are getting more and more complex.

The SC can be defined as a type of a dynamic system in which information, money and products are constantly exchanged among the chain participants (Pupavac, 2013).

The manufacturer produces and sells a final product that consists of two components. One component is provided by the supplier and the other component is offered by the manufacturer. The supply chain can be considered a network of structures, distribution, transformation of procured materials into semi-products or final products for buyers (Satyendra and Bhat, 2014).

SC defined also as set of entities involved directly in the upstream and downstream of products, services, finances and information from source to customer (Mentzer et. al, 2001).

There are many definitions of the SC, however, it may be concluded that the SC is a flow of goods, services and information from suppliers, through transport, producers, distributors, and retailers to the final customer. (Drljača, 2019). It can also be concluded that the SC is a complex system of integration of suppliers, producers, distributors and traders for the purpose of production and distribution of goods/services in the right quantities, in the right place and at the right time, all with the aim to balance supply and demand.

The SC can also be described as a series of activities and organizations through which materials pass during their journey from initial suppliers to end buyers (Monczka et al., 2010).

For the normal course of the SC, it is necessary to ensure a number of assumptions, including infrastructure.

In this paper, the subject of research is the role and position of Airport City, as a significant logistics infrastructure, in the SC. The final aim is to improve the supply chain's long-term economic performance. Besides that, this concept may provide operational benefits as well as positive impacts on society (Croom et al., 2018).

2. Experimental

Fig. 1. is displayed the SC from raw material procurement through production, storage, and distribution to the end user or customer. This approach is characterized by a one-way movement because it ends with delivering to the final customer, ie disposing of the waste into the environment after consuming the product.

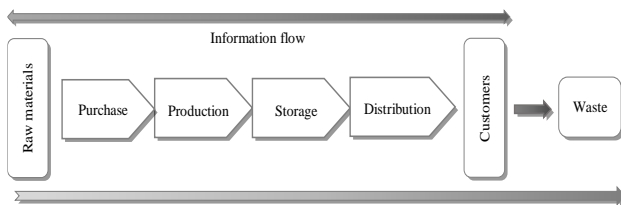


Fig. 1. Traditional approach to the Supply Chain

From the saturation point of the sustainable development philosophy, this approach is inadequate because it is a major burden on the environment with the tendency to permanently damage it. Therefore, this approach needs to be changed in such a way as to ensure the circular flow of the material, as shown in Fig. 2.

Fig. 2 shows the modern SC approach, which is characterized by a feedback. SC does not end at the point of distribution to the final customer through retail and consumption and disposal of waste that remains after product consumption in the environment. Modern SC approach includes a selective waste collection system, a recycling process and re-use of recycled waste in production. Non-recyclable waste is permanently disposed of in a non-hazardous manner.

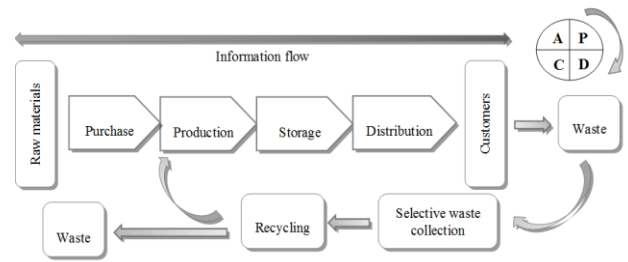


Fig. 2. Modern approach to the Supply Chain

This modelled SC is continually developed and is based on two essential principles: 1) sustainability principle; and 2) principle of product vision throughout the life cycle. It is assumed that each SC cycle is at a higher level of quality, using a PDCA cycle known as the "Deming Cycle" (P-Plan, D-Do, C-Check, A-Act) (Deming, 1991.).

3. Results and discussion

In order to define the Airport City (AC) phenomenon, it should first be defined by Aerodrome and then Airport. By the ICAO definition, an aerodrome is defined as an area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft. (ICAO Annex 14, 2018. On the other hand, the Airport usually refers to an aerodrome with passengers or freight facilities.

However, Airport is a complex industrial enterprise. It acts as a form in which various elements and activities together enable the movement of passengers and cargo in the air and on the ground. ... Airport provides a wide range of services and content that can be divided into three different groups: basic operational services, handling services and commercial activities (Doganis, 1992).

AC is often referred to as the "inside the fence" of the airport and usually includes facilities such as: passenger terminal, apron, taxiway, runway, and other airport activities such as: cargo handling, logistics, office space, retail, hotels, conference centres and the other AC concept represents the model by which the airport leaves a traditional model dominating aeronautical services and developing non-aeronautical commercial facilities, services and sources of revenue (Airport World, 2015). Although during 90's aeronautical revenues was approx. 80% of the total airport revenues, today situation is that that share is 60% aeronautical and 40% non-aeronautical (in Europe at some airports even more - 50% non-aeronautical revenues). (ACI).

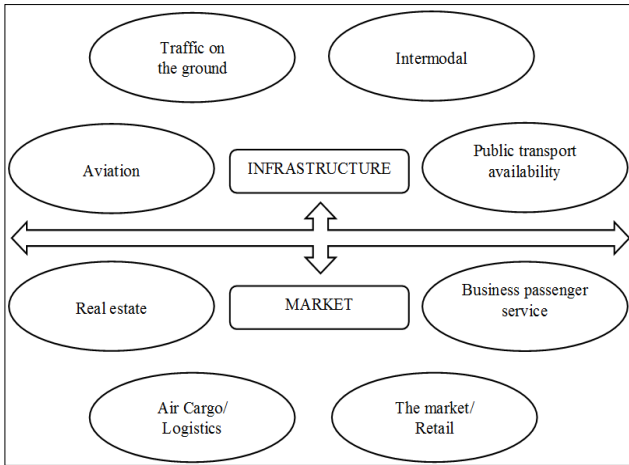


Fig. 3. The core activities of Airport City

Airports become urban anchors because of the volume of passenger traffic and the on-airport employment directly supporting that movement. They also attract related and unrelated employment to their vicinities. Some of that employment, such as in the hotel sector, may service air and other travelers. Some of that employment is in sectors, such as producer services, which may be heavy consumers of air travel (Erie et al., 1999) and other nearby employment may have no strong direct link to air travel but be attracted nevertheless.

3.1. Models of Airport City

There are several AC models in Europe as shown in Table 1. In doing so, the two factors have a crucial influence on the choice of the AC model and the investment in AC. As described in Table 1, these are: 1) airport distance from city center and 2) availability of land for building AC content. Taking into account the above-mentioned circumstances, it is possible to talk about the following AC models (Czernecki and Skoczny, 2013; Drljača, 2017).

Model 1.

When the airport is located 20 and more km from the city center. This model is characterized by the availability of a large area of free space with a lower population concentration. This model is most commonly encountered at airports recently built at airports built as greenfield investments. For this model it is significant that the noise problem is not significant. Some of the airport examples that have applied this AC model are Athens, Gatwick, Helsinki, Arlanda and Berlin Brandenburg Willy Brandt Airport.

Model 2.

When the airport is located relatively close to the city center. This model is often chosen when the airport is an investor in the AC infrastructure. In this case, AC is relatively small and consists of only a few buildings. In extreme cases it consists of one hotel and business building. Due to close distance of AC to the airport and the city center, on this model it will be high influence regarding noise regulations and land use.

Model 3.

When a big airport builds infrastructure in its immediate vicinity. In this model, infrastructure construction includes a logistic park or Cargo City. As already noted, several of the airports listed are also important international cargo gateways (Appold and Kasarda, 2013). Infrastructure is being built near the airport. It also covers the construction of a railway station that is only a few hundred meters away from the passenger terminal. Business buildings are also close to the airport. Non-aeronautical revenues reach up to 70% of total revenue. A typical example of the application of this AC model is the Frankfurt airport.

Table 1. Characteristics of the Airport City models

Model	Distance to town	Land	Concentration of population	Concept of construction	Examples
I.	20 km <	Large area of free land	Low	Modern, Greenfield investment	Athens, Gatwick, Helsinki, Arlanda, Berlin Brandenburg
II.	Near the centre	Small area of free land	Big	Airport as an investor	
III.	Infrastructure near the airport	Large area of free land	Big	Includes Cargo City	Frankfurt
IV.	Almost in the centre	Free land is limited	Big	Excellent traffic connectivity	Düsseldorf
V.	< 20 km	Cheap, available	Low	It is developing as a marketing brand. Common Marketing strategy.	Helsinki-Vantaa, Zagreb
VI.	Located in the city 10-15 km from the airport	Small area of free land	Very big	„City in the city“ Good traffic connectivity.	Belgrade

Model 4.

When the airport is located almost in the city. This model is characterized by excellent traffic connections between the airport and AC with the city. AC represents the significant development potential of the city in which it is located.

Interruptions in the movement of goods and people require some support activities, provide the favorable pre-conditions for the location of other activities and may also attract yet other activities with a range of causal factors operating (Appold and Kasarda, 2013). This is because facilities such as: hotels, congress center, parks, restaurants, business premises, car salons etc. make the AC contents. It is

actually a small town that is interesting to users and visitors. An example of the application of this AC model is the Düsseldorf Airport.

Model 5.

When AC develops as a marketing brand that promotes the surrounding area. It is about promoting the surrounding area of the airport as a convenient location for building AC and economic development. AC includes business buildings and shopping centers, hotels and logistics centers. This model is characterized by good communication, cheap land, cooperation with the local community. The local environment and the airport with its AC are developing as a common marketing brand and using a common marketing strategy. An example of this model is using Helsinki-Vantaa Airport and Zagreb in accordance of its AC Master plan.

Model 6.

When AC is completely out of the airport. Extensive land needs, noise considerations exacerbated by early jet engines and the marginal role of air travel in daily living in earlier decades pushed airports progressively further from city center (Appold and Kasarda, 2013). The assumption is excellent traffic connectivity and the existence of several public transport lines. AC makes multiple business buildings, garages and other related facilities. The vicinity of the highway is important. It is about the concept of "city in the city", with AC using the existing infrastructure of the city in which it is located (traffic, communal and so on). AC is 10-15 km from the airport, 10-20 minutes by public transport or by car from the airport. An example of this AC development model is the Belgrade Airport.

AC as a concept of development should represent the vision of aerodrome development. So the Amsterdam Schiphol airport in its vision wrote: "The Schiphol Group is looking at the airport as Airport City, a dynamic center for people and business, logistics and commerce, information and entertainment" (Drljača, 2017).

Researching the AC phenomenon needs to be seen in context. This phenomenon has an internal and external context. Its internal context is made up of an airport (runway, passenger terminal, etc.) and other AC facilities such as: hotels, congress centers, business premises, gas stations, recreational facilities, health facilities, shopping centers, parking lots, Cargo Centre and others. Its external context is made up of Aerotropolis (Kasarda, 2008) and the national and global framework, since the air traffic sector is a global activity (Fig. 4). Already today is contemplated about the new future content of AC, which is an airfield for aircraft flying to orbit Earth (Airport World, 2016).

Aerotropolis is a new urban form characterized by cities built around the airport, well-connected, which enable good co-operation between suppliers, manufacturers, distributors and business people with remote customers and service users and markets.

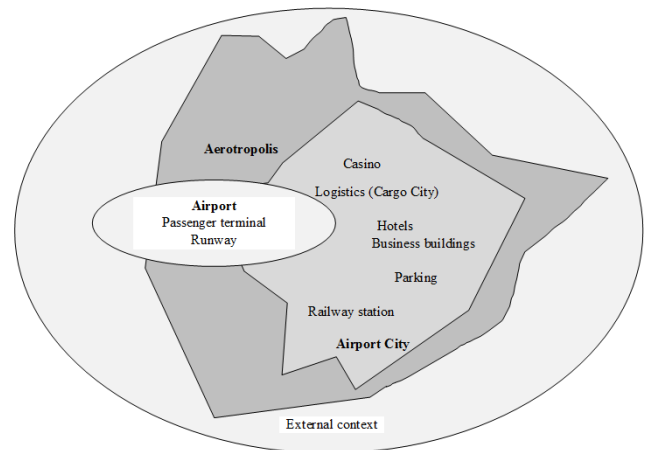


Fig. 4. Airport City context

The airport city portion of the aerotropolis is often viewed as confined to airport property. This gives a clean definitional break to the aerotropolis's two main geographic components. But, just as central cities did not stop growing at their political boundaries, airport cities frequently spill over airport boundaries.

4. Airport City as a part of the Supply Chain

In AC, very often there is the logistics infrastructure and the superstructures. Under the logistic infrastructure in this context, it is meant: warehouses (terminals) for different purposes, roads for external and internal traffic, parking lots etc. The superstructures understand all the necessary equipment and means of transport used in carrying out logistics activities within the AC.

4.1. Airport City as a part of Supply Chain – Traditional approach

AC having the above mentioned logistic infrastructure and superstructures can take over certain SC functions, such as storage and distribution.

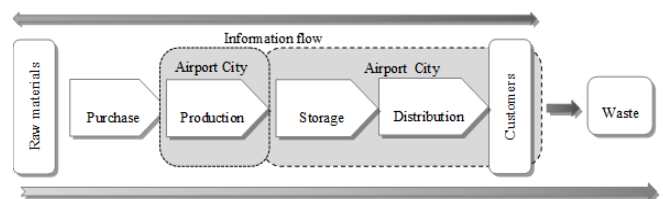


Fig. 5. Airport City as a part of the Supply Chain

– Traditional approach

Depending on the degree of development of AC, it is possible that a certain infrastructure intended for production and refinement is located on AC. In that case, AC assumes basic structural elements of SC, production, storage and distribution, marked gray in the Fig. 5.

4.2. Airport City as a part of Supply Chain – Modern approach

If SC is modeled on the principles of sustainability and product life cycle, ie if it is a modern approach, it is a characteristic activity for the purpose of continuous improvement. Depending on the degree of development of logistics infrastructure and superstructures, production, storage and distribution activities can be performed within the AC, marked gray in the Fig. 6. However, this will also require the construction of a waste management system and will also conduct selective collection of waste within the framework of this AC system within its ecological islands and the recycling yard.

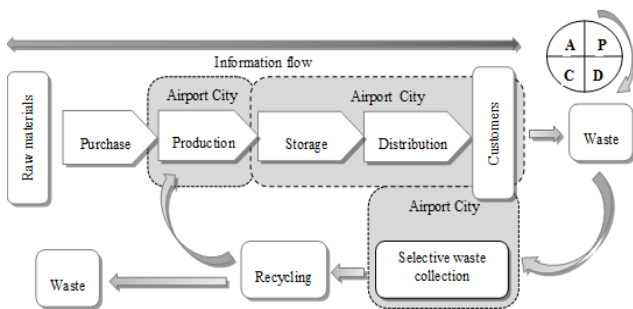


Fig. 6. Airport City as a part of the Supply Chain – Modern approach

SC modelled as Modern approach is a very complex urban structure that requires the coordination of all participants and interested parties. It represents a significant center of economic activity and commodity flows. In that sense, it also becomes a significant factor in the social stability of the gravitational area.

Developed ACs that also have logistics-distribution center and cargo infrastructure are developed at locations that are favourable from the standpoint of multimodal transport. As a rule, it is well-organized in different types of transport and traffic: air, rail, road, often waterways. This is especially important because the transport is the backbone and the assumption of SC. All SC stages from raw material procurement, through production and storage, to distribution to the end users or customer, are connected by transport, among other things, by air, because with certain assumptions the aircraft can carry almost all kinds of cargo. No SC transport can't take place. SC is dead without transportation.

5. Conclusion

A significant quantity of goods makes commodity flows through the cities. It is about all kinds of products needed for large agglomerations. Most of the goods flows are by road, sea and rail transport. Larger cities generally also have airports. Modern airports also develop their ACs according to one of the most common models (Supra 3.1). Given that commodity flows often have starting points in distant areas of the world and also originates worldwide, air transport also has its place in SC. Cargo air transport has less than 1%

of total world trade volume, but 35% by value (IATA, 2018). By air, in certain circumstances, different types of goods can be transported. In addition, developed ACs at airports often have a production component and generate certain commodity flows themselves. Taking all this into account, the logistics distribution centers within the AC capability are assuming certain functions within SC. Particularly this refers to the storage, distribution and part of transport functions when it comes to the SC's traditional approach, ie besides the aforementioned production and selective waste collection and part of transport functions, when it comes to SC conceptualized on a modern approach. For these reasons, the AC is a part of SC, regardless of the AC model.

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机场城市在供应链中的角色和地位

關鍵詞

飞机场
机场城市
供应链

摘要

过去，机场拥有一条跑道和一个适中的航站楼就足够了。空中交通的发展也增加了客户需求（旅客，航空公司等），这影响了对机场基础设施发展的需求。全世界已经建造了旅客航站楼，根据建筑解决方案，其中许多都是艺术品。量身定制的设计和可以延长逗留时间，并满足旅客和其他用户的要求。内容和概念提供了机场运营商提供额外收入的解决方案。内容和功能的一部分在旅客航站楼中提供，另一部分在机场航站楼内或机场外提供。此内容的一部分由机场城市（AC）提供。AC现象表示基础架构，上层建筑，信息和运营的集成。它代表了供应链（SC）的一部分，通常包括以下设施：旅客候机楼，跑道和其他机场活动，例如：地面处理，物流，办公空间，商店，酒店等。在本文中，作者使用系统理论方法，建模方法和比较方法作为一般的和某些特定的科学认知方法，以研究不同的AC模型及其结构可以对最佳SC流做出贡献并带来结果的问题AC现象作为SC的一部分。
