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HOW INDUSTRY 4.0 WILL CHANGE AIRLINES MARKETS

ИНДУСТРИЯ 4.0 АВИА ТАШУУ РЫНОГУН КАНТИП ӨЗГӨРТӨТ

КАК ИНДУСТРИЯ 4.0 ИЗМЕНИТ РЫНКИ АВИАПЕРЕВОЗОК

Abstract: *In the last four years the world underwent substantial changes – as well in geopolitical manners as well as in dealing with other global crises that we haven't seen for more than 100 years, like the CoVid-19 pandemic. Several industry sectors had to adapt after 2020 immediately to the effects of the sudden outbreak of the pandemic. Probably the most – and firstly – affected industry were the airline markets. Thousands of people had to be transported from one day to the other back to their home countries, alone the government of Germany and its Ministry of Foreign Affairs chartered 260 aircrafts bringing home over 236,000 citizens in March 2020 (Bundesgesundheitsblatt 2021, p. 458). Right afterwards the whole market collapsed within days – travel was restricted (Drljaca et al 2020, p. 2). Like it is common knowledge the industry more than recovered in most countries worldwide by 2025 - even with geopolitical turbulences tourism is more favoured like ever before. One of the most interesting topic of current research is the question how Industry 4.0 will affect the future of airline markets and how also airport operations will change due to this (see Drljaca et al, 2020). This article will give a closer insight into this research question.*

Keywords: *Industry 4.0, COVID-19, aviation, digitalization, smart airports*

Аннотациясы: Акыркы төрт жылда дүйнө олуттуу өзгөрүүлөргө дуушар болду – геосаясий аспектилерде да, ошондой эле 100 жылдан ашык убакыттан бери биз туш келбеген башка глобалдык кризистерди чечүүдө да, мисалы COVID-19 пандемиясы. Бир нече өнөр жай тармактары 2020-жылдан кийин пандемиянын капысынан башталышынын натыйжаларына бир заматта ыңгайлашууга мажбур болушту. Балким, эң көп жабыр тарткан тармак авиация индустриясы болгон. Миңдеген адамдарды бирэки күндүн ичинде өз өлкөлөрүнө кайтаруу керек болду; жалгыз Германия өкмөтү жана Ташкы иштер министрлиги 2020-жылдын мартында 236 000ден ашык жарандарды үйлөрүнө жеткирүү үчүн 260 учакты жалдаган (Bundesgesundheitsblatt, 2021, 458-б.).

Андан кийин эле бүт рынок саналуу күндөрдө кулап калды – саякаттар чектелген болчу (Дрляча ж.б., 2020, 2-б.). Белгилүү болгондой, 2025-жылга карата тармак дүйнөнүн көптөгөн өлкөлөрүндө калыбына келди – геосаясий чыр-чатактарга карабастан туризм мурда болуп көрбөгөндөй актуалдуу болуп калды. Заманбап изилдөөлөрдүн эң кызыктуу темаларынын бири – Индустрия 4.0 авиа ташуу рынокторунун келечегине кандай таасир этет жана мунун натыйжасында аэропорттордун иш-аракеттери кандай өзгөрөт деген суроо (кара: Дрляча ж.б., 2020). Бул макала ушул изилдөө суроосу жөнүндө кеңири түшүнүк берет.

Негизги сөздөр: Индустрия 4.0, COVID-19, авиа ташуулар, санариптеширүү, акылдуу аэропорттор.

Аннотация: За последние четыре года мир претерпел значительные изменения – как в геополитических аспектах, так и в решении других глобальных кризисов, с которыми мы не сталкивались более 100 лет, таких как пандемия COVID-19. Несколько отраслей промышленности вынуждены были сразу же адаптироваться к последствиям внезапного начала пандемии после 2020 года. Возможно, наиболее пострадавшей отраслью была авиационная индустрия. Тысячи людей пришлось переправить за день-два обратно в их родные страны; только правительство Германии и Министерство иностранных дел зафрахтовали 260 самолетов, чтобы доставить домой более 236 000 граждан в марте 2020 года (Bundesgesundheitsblatt, 2021, стр. 458). Сразу после этого весь рынок рухнул в считанные дни – поездки были ограничены (Дрляча и др., 2020, стр. 2). Как известно, к 2025 году отрасль более чем восстановилась в большинстве стран мира - даже с учётом геополитических потрясений туризм стал более актуален, как никогда ранее. Одной из самых интересных тем современных исследований является вопрос о том, как Индустрия 4.0 повлияет на будущее рынков авиaperевозок и как изменятся операции аэропортов в результате этого (см. Дрляча и др., 2020). Эта статья даст более детальное представление об этом исследовательском вопросе.

Ключевые слова: Индустрия 4.0, COVID-19, авиaperевозки, цифровизация, умные аэропорты.

How CoVid-19 influenced airline business models

The airline industry traditionally revolves around various business models, such as FullService Network Carriers (FSNC) and Low-Cost Carriers (LCC), each designed to create, deliver, and capture value uniquely to remain profitable and competitive. As the aviation sector continuously evolves, unconventional and innovative thinking becomes essential for meeting customer expectations and maintaining loyalty, especially in light of rapidly changing circumstances (Mrázová, 2016). Central to a successful airline business model is understanding how revenues are generated, whether through aeronautical or non-aeronautical means, the products offered, and the target customer segments. Customer satisfaction serves as a key indicator of an airline's success or failure. The industry has faced numerous crises, like the financial meltdown in 2008-2009 and the September 11 terrorist attacks in

2001, which had pronounced impacts on passenger demand and airline operations (Sherrisse, 2020). The SARS outbreak between 2002 and 2004 also significantly disrupted global passenger traffic. However, the COVID-19 pandemic has introduced unprecedented challenges that led to deep economic losses throughout the airline industry. As a result, airlines have had to rapidly adapt strategies to sustain operations and prepare for recovery (EUROCONTROL, 2020). The pandemic caused a dramatic decline in air traffic, with major carriers like Ryanair, easyJet, and Air France experiencing substantial passenger reductions. This situation forced airlines to reconsider their operational approaches, highlighting the urgency to diversify revenue streams, particularly in non-aeronautical areas (EUROCONTROL, 2019). Fuel costs remain a critical component of airline operational expenses, especially as the industry grapples with the need to push these costs to a minimum in the postCOVID-19 era. For FSNCs, this may involve strategic shifts such as replacing four-engine aircraft like the Airbus A380 with more fuel-efficient, two-engine alternatives such as the Boeing 787 Dreamliner, known for its substantially lower fuel consumption per passenger (Minwoo et al., 2019). Improving fuel efficiency is not only a cost-saving action but also a strategy to enhance competitiveness in a challenging market. Post-COVID-19 recovery scenarios for airline business models focus on both immediate adaptation and long-term strategic shifts. The entry of LCCs into the market disrupted the former dominance of FSNCs, thanks to deregulation and competitive pricing strategies (Tomová A. et al., 2017). Despite the pandemic, LCCs maintain a strong foothold, commanding a significant share of the seat capacity in global markets. As airlines like AirAsia pivot towards domestic routes, such strategies aim to capitalize on favorable geographical and tourism conditions to keep operations afloat. The pandemic has also accelerated the adoption of digital technologies and innovation within the airline industry. The implementation of biometric systems and contactless processes facilitates safer and more efficient passenger travel, addressing both safety concerns and operational efficiency. Additionally, creative offerings like "flights to nowhere," which provide passengers with the travel experience without a traditional destination, exemplify how airlines are exploring new avenues for customer engagement and potential revenue streams. In conclusion, the current aviation landscape is marked by the dual challenge of minimizing costs while exploring novel revenue opportunities. Airlines need to emphasize fuel efficiency and ancillary revenue streams while embracing digital transformation to better adapt and thrive in the post-pandemic world. Whether this challenging environment will ultimately lead to new business models or the refinement of existing ones remains to be seen, but the industry is clearly in a state of transformation. (see also Mrazova, M. & Kazda, A., 2021)

Status-quo

Historically, air travel has consistently exhibited positive growth trends despite various crises such as global recessions, terrorism, and epidemics like SARS, MERS, and avian flu. While these events were disruptive, the aviation industry typically rebounded quickly. However, the COVID-19 pandemic, identified on December 31, 2019, presented a significant divergence due to its widespread health impacts and the resulting travel restrictions imposed globally. By early 2020, COVID-19 had spread internationally, severely impacting air traffic and causing passenger numbers to plummet by up to 99% in certain months compared to 2019. This decline was more severe than any preceding crisis, underscoring the pandemic's profound effects on air travel and the global economy, further highlighting the close interconnection between GDP and air transportation demand. The pandemic's impact on air travel was primarily driven by governmental travel restrictions aimed at curbing the virus's spread, leading to a 69% reduction in global passenger traffic from January to August 2020, with financial losses ranging from 350 to 400 billion. The ICAO and IATA reported significant declines in both international and domestic travel, resulting in the grounding of two-thirds of passenger aircraft worldwide. The economic repercussions extended to employment, with an estimated 400,000 airline workers facing job losses. European airports experienced a drastic 98% reduction in passenger traffic in early April 2020, with revenues falling by over \$97 billion. Airlines and regulatory bodies quickly adapted by

categorizing flights into risk levels and applying differentiated preventive measures based on factors such as flight origin, aircraft equipment, and duration. As airports and airlines navigated immediate impacts, they focused on protecting staff, managing cash flow, and maintaining brand reputation. Looking forward, they needed to reevaluate business models to withstand prolonged economic impacts and prepare for long-term operational changes, including modifying location strategies, staffing models, and digital integration. Future airport sustainability relies on the adoption of digital technologies and the Industry 4.0 framework to enhance efficiency and passenger experiences while maintaining safety standards. Key areas of focus include optimizing airport operations, improving the passenger journey by reducing congestion, and increasing nonaviation revenues through digital innovations. The integration of technologies such as contactless IT solutions, biometrics, and documentation digitalization is vital in addressing ongoing challenges and ensuring seamless, reliable air travel. The concept of "Smart Airports" emerges as a crucial component of Industry 4.0, aiming to reduce direct contact between passengers and staff while optimizing processes. Smart Airports incorporate elements such as Smart Mobility, Logistics, Infrastructure, Services, Equipment, and Grids, all centered on leveraging ICT to enable autonomous equipment communication, real-time monitoring, and data-driven decision-making. The shift towards smart technologies promises to enhance safety, reduce infection risks, and maintain high service quality in line with evolving passenger expectations. The COVID-19 pandemic has forced the aviation industry into a new era of operational strategies, with Industry 4.0 playing a critical role in its normalization. Smart Airports and digital solutions are essential to meeting the challenges of today and the future, ensuring adaptability, resilience, and competitiveness in a post-pandemic world. As the industry navigates these transformative changes, the integration of innovative technologies will be crucial in shaping the future of air travel, enabling a more dynamic, efficient, and customer-focused aviation environment. (see also Drljaca et al, 2020)

Future of Airline Markets (airports and airlines) under the influence of Industry 4.0

Companies must identify different customer groups and tailor their products and services to be successful. Key channels, especially digital ones, are essential for reaching and retaining customers. Meanwhile, customer relationship management emphasizes that strategies should focus on understanding and meeting customer needs. Revenue models are vital for generating income from various customer segments. Industry 4.0 has driven profound changes in economic and societal paradigms through technological advancements. Open innovation is indispensable for keeping up with technological developments. While automation has the potential to impact employment, the fourth industrial revolution also demands new skills in strategic and creative thinking. In aviation and airports, several technological trends are emerging. Intelligent automation through artificial intelligence is revolutionizing processes, enhancing efficiency, and fostering innovation. Additionally, the concept of a liquid workforce requires a flexible and adaptable approach to work, driven by technological advancements that significantly alter traditional work models. Digital platforms define modern business environments by supporting connected and scalable markets. Companies need to strategically respond to predictable disruptions arising from changes in digital ecosystems. Lastly, digital trust remains fundamental. With the growing adoption of new technologies, such as biometrics in air transport, strong ethical and security practices are essential. These insights provide a solid foundation for understanding the interconnectedness of business strategies, technological innovations, and dynamic strategic planning, particularly in rapidly changing sectors like aviation. (see also Sahin et al, 2019).

Conclusion

In conclusion, the airline industry has proven its resilience in the face of unprecedented challenges, particularly with the advent of the COVID-19 pandemic. This crisis, unlike previous disruptions, required a swift and comprehensive adaptation of business models, necessitating airlines to not only manage immediate impacts but also strategize for long-term sustainability. The pandemic

accelerated the adoption of digital technologies, with Industry 4.0 playing a crucial role in transforming airport operations and redefining passenger experiences through innovations such as biometric systems and contactless processes. Airlines are compelled to balance cost efficiencies, such as through improved fuel management, with the exploration of novel revenue streams to remain competitive in a transformed market landscape. The shift towards more efficient aircraft and the strategic diversification of revenue streams highlight the need for both operational and structural changes within the industry. Furthermore, as digital platforms and advancements in artificial intelligence continue to reshape the business environment, maintaining digital trust and embracing innovation will be fundamental to sustain growth and meet evolving passenger expectations. The future of the airline industry, underpinned by the principles of Industry 4.0, promises a more dynamic, efficient, and customer-centric approach, ensuring its long-term resilience and success in a post-pandemic world.

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