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New Forms of Leading the Aviation Firms. International Perspectives of Future Trends in Global Aviation Industry

Abstract

Polish air transport is an important component of both the European and global transport services market. Enterprises and institutions responsible for its development should be conducive to shaping the most competitive position of entities of the air transport market. In Polish airports and branch infrastructural investments, balanced and sustainable development should be taken into account, determining the level of quality of services provided and access to the market. These aspects are highlighted in the strategy for the development of regional airports, whose task is also to stimulate the mobility of people and their transport activities.

Air transport, although it is a relatively young form of transport, the history of which goes back over a hundred years back, is nowadays a very important element of the global economy. In the last decades the air passenger transport was treated as an elite one. It has now become very common and has contributed to the mobility of people in many regions of the world. More and more often, not only global companies or corporations are talked about, but also - referring to the ease of moving, taking up work or studying in different parts of the world, away from the home country, people choose most often the air transportation.

Key words: aviation, airline, business model, strategy, competition, jet engine

Many factors have contributed to the popularity of air travel. Among them was technical progress and the application of new technological solutions in air transport, but also legal and organizational changes. For many years, air transport was one of the most regulated sectors of the economy (Grzywacz, et al., 2003) when we take into account non-economic type of regulations. This type of regulations is characteristic for many sectors of the economy, while economic regulations were most concerned with transport (Pijet-Migoń, 2012). Bilateral agreements dominated in international transport. Economic regulations and in most countries the monopolistic position of the so-called national carriers have contributed to the very high prices of

air travel and, consequently, to a relatively low interest in them. It was no different in Poland, where political role played an additional role. As a result, the aviation issue appeared marginally in geographic surveys conducted in Poland.

The development of air transport and its market is a dynamic process, determined by the impact of many various economic factors. Despite periodic difficulties related to the economic environment, political situation, availability of energy carriers, this process is continuous. It seems that in the future its dynamics and volatility will be constant, especially in the face of the ongoing globalization, which, among others, there is a need for efficient and safe movement of people and goods.

Air transport is also an interpretation of the development of the world economy, now linked - as never before - with the transfer of people, goods and information. Determines the availability of markets with increasing geographic coverage, reducing time, costs, increasing the rate and size of the flow of cargo. The forecasts of the development of the cargo transport market show that in the perspective of 20 years it will grow at a rate of 5 per cent annually on a global scale (*Current Market*, 2012). Indirectly, it is a multiplier of the economic effect, thanks to which the prices of goods fall, and their offered diversity increases.

The dynamic development of the air transport market in the coming years will probably enter a phase in which it will change and revolutionize its current shape and functioning. The factors conditioning changes will be: further development of information technology and digitalization, new materials and construction concepts, the use of new alternative fuels, changes in operational procedures related to care for the natural environment and the use of air transport, and its significance for society.

Over the past decades the airline industry has been shaped with a number of complexed changes, i.e. increased market share and competition of low-cost airlines as well as many other factors that shaped the sector's boundaries. Trying to see the future of airline industries we have to take into account the aspects linked with changing technology and innovation that is linked with higher customers' expectations. It has to be highlighted that abovementioned innovation creates the element of the market disruption (Christensen, 1997). On the other hand, the element that causes the significant impact is linked with geo-politics. Although those two factors have essentially strong influence on the sectors' shape, there are many of the new challenges are always on the horizon.

It's hard to find an industry that hasn't at some point been knocked sideways by unexpected developments or changes in the rules. Change can be sudden and overwhelming, or gradual and unnoticed; in either case the result can be hard to manage - and sometimes fatal - for organizations not actively preparing for it. But drivers of change can also be political and regulatory, social and economic - not forgetting environmental factors and policies designed to address them. The good news is that, while the future is unpredictable, there are steps we can take to be better prepared for what it may bring. As an aviation community, armed with an analysis of future trends and acting with a common purpose you can take steps to influence how the future unfolds. And as a commercial player in the airline industry, you can add these insights to your strategic thinking to gain a competitive edge. The global nature of the air transport market requires arrangements at the inter-state level in

the areas of legislation, technology, exploitation, organization, trade, economics and ecology. An important role is played by international air transport organizations and institutions, whose task is to organize a safe air space for its participants (Ruciński, Madej, 2016). When talking about the economic situation of the aviation sector, it should be mentioned that it is significantly affected by the drop in oil prices, the increasing value of the brand of carriers, better economic situation of carriers and the financial results of airlines (Tłoczyński, 2016).

Table 1. Drivers of Change for the Airline Industry, STEEP Framework

Society	Technology	Environment	Economy	Politics
<ul style="list-style-type: none"> - Terrorism - Urbanization and the growth of megacities - Passenger identity and fraud - Global aging - Middle class growth in China and the Asia-Pacific region - New modes of consumption - Tensions between data privacy and surveillance - Global population growth driven by Asia and Africa - Shifting ethnic, political and religious identity - Disability, fitness and health 	<ul style="list-style-type: none"> - Cybersecurity - Expanding human potential - Robotics and automation - 3D Printing and new manufacturing techniques - Virtual and augmented reality - Internet(s) of Things - Alternative fuels and energy sources - New aircraft designs - Alternative modes of rapid transit - Geospatial technology 	<ul style="list-style-type: none"> - International regulation of emissions and noise pollution - Resource nationalism - Personal carbon quotas - Water and food security - Environmental activism - Extreme weather events - Rising sea levels and reclaimed habitats - Human-controlled weather - Circular economy - Infectious disease and pandemics 	<ul style="list-style-type: none"> - Global income inequality - Strength and volatility of global economy - Price of oil - Level of integration along air industry supply chain - Shift to knowledge-based economy - Privatization of infrastructure - Concentration of wealth into a «Barbell economy» - Unionization of labor and regional independence - Open data and radical transparency - Changing nature of work and competition for talent 	<ul style="list-style-type: none"> - Bribery and corruption - Geopolitical (in)stability - Government ownership of airspace and critical infrastructure - Strength of governance - Anti-competitive decisions - Defense priorities dominate civilian needs - Shifting borders, boundaries, and sovereignty - Increasing influence of alternative regional and global institutions - Trade protection and open borders - Rise of populist movements

Source: IATA, Future of the Airline Industry 2035

The evolution of goods (products and services) into intelligent, and in most of the cases connected devices that are increasingly embedded in much broader systems is radically reshaping the shape of the companies and the mode of nowadays competition. Smart, and connected products in general require a completely new technology infrastructure. This type of technology provides so-called gateway for exchange of data between the product and the final customer (user). It integrates data from variety of business systems, external components, and other related products (Porter, Heppelmann, 2015). It's important to mention that this technology also

serves as the platform for data storage and analytics. The most significant trend in the airline industry has been the gradual liberalization. This has had profound effects both on market structure and on operating patterns (Doganis, 2005).

Information technology is in many areas revolutionizing today's products. Products in a relatively short amount of time have become complex systems and they combine hardware, sensors, data storage, microprocessors, software, and connectivity in myriad ways (Porter, Happlemann, 2014). All of the smart and connected products were introduced to the markets because of the large in scale improvements in processing power of computers and miniaturization of devices.



Figure 1. The process of finding the trends

Source: Own preparation based on IATA, IATA, Future of the Airline Industry 2035, International Air Transport Association, School of International Futures, 2017

Together they unleashed a new era of competition, in the Figures 1 and 2, you can find the visual presentation of the development of the future scenarios for the airline industry as well as four main areas of strategy shift in the perspective of the development of the sector.

NEW FRONTIERS

In the trend linked with new frontiers, in a world which has seen a shift of power to the East associated with the new creation of alternative institutions. The modern way of competition for economic and military power has shifted to new frontiers, including the space. China has become a champion of development sustainability. Access to information in modern economies is open and democratized, empowering people, companies and organizations. However, due to serious level and threat of cybercrime, state surveillance, other challenges persist even on a broader scale. Global instability makes people nervous travelers – especially when we think about given recent bio-bombs targeting specific genotypes and the growing trend towards ‘homemade’ and targeting different segments security threats. We have also seen a huge increase in transnational crime, that is connected with virtual communities of interest that coordinates cyber-attacks across borders.

SUSTAINABLE FUTURE

The second scenario is connected with the peaceful, even multipolar world in which strong international significance of the governance that has allowed infrastructure decisions to be prioritized. Open access to information and large advances in big data, predictive processes of analytics and artificial intelligence (AI) have had a highly positive impact on society. Rapid and in often cases disruptive innovation helps people meet sustainability targets, while new trade destination have opened

up within and between the Global South and Asia-Pacific. There were two drivers of this change of sustainable future. First, the rise of citizen movements in the early part of the 21st century, linked globally through the internet and rapid growth of social media. In fact, they challenged governments and the global institutions on the effectiveness of their policies. Second, MNCs, NGOs and multiple networks for citizens have been much quicker to respond to the disruption (mainly on the innovation side) caused by global flows of modern people, information and data than territorial states.

RESOURCE WARS

A turbulent modern world in which an aggressive, nationalistic China threatens a US distracted by continued conflict. The Middle East and Asia have seen a wave of territorial disputes and land grabs, and the world has realigned into resource trading blocs. Abovementioned inequalities between resource rich and poor regions have limited strategic movements between regions. Data asymmetries also exist between countries, and governments increasingly use data to strictly monitor and control their citizens. The growth of the middle classes in emerging economies has

not helped. Companies and modern governments alike rush to satisfy a new world of tech-consumers who want more and better food, faster devices, and to see the world – but they ignore long-term investment decisions and frequently promised what they could not deliver. As the cost of commodities and water drove prices up, they were increasingly held accountable. This scenario is very pessimistic, some countries have seen a proliferation of small and medium-sized cities, growing in an unregulated fashion, often in rural areas. These cities exist in an unstable equilibrium – seasonal and resource jobs are available, but with limited infrastructure and finite resources life gets increasingly difficult when they grow too big, especially we we think about the resources such as water and food shortages.

PLATFORMS

What can be seen in the 21st century is the battle of the global recourses in the world's key players. The resource wars are linked with the fourth scenario trend. A peaceful world in which China and the US have cooperated to open up international trade.



Figure 2. Future scenarios of airline industry

Source: Own preparation based on IATA, IATA, Future of the Airline Industry 2035, International Air Transport Association, School of International Futures, 2017

Corporations play an increasing role in the economy, and a dominant elite controls data and data platforms. Africa has failed to enter the global stage with a collapse in commodity prices. In many countries, a disempowered public is increasingly dissatisfied with the political elite. Competition has driven down global profit margins. Companies compete for a limited segment of users, either undercutting incumbents on price (cost structure), or leveraging profits in industries such as tech (revenue streams), finance and pharmaceuticals to capture users in other sectors. Margins are particularly squeezed in capital-intensive industries, where operational efficiency has become critical. A key driver for this has been the rapid pace of innovation.

ROLLS-ROYCE WAY OF INTERNET OF THINGS

The Internet in general is an extremely important new technologies. Today it has much attention from executives, investors and entrepreneurs, including also those who only observe the markets. It can be said that the Internet changes everything, understood as changing old rules about companies and competition obsolete. Many firms, have used Internet technology to shift the basis of competition and competitive advantage away from the products quality, it's features, and service and toward price, making it difficult for anyone in their industries to turn a profit. Other ones have achieved advantages by rushing into misguided partnerships (in most of the cases – alliances) and outsourcing relationships.

The Internet of Things (IoT) was unofficially welcomed to the world sometime around 10 years ago, at the point when the number of connected devices exceeded the number of people using the Internet (Hunt, 2015). The IoT basically entails the connection of regular physical 'things' with the Internet. In 21st century everything becomes inter-connected. That creates a specific network comparable to the neural system of the human body. There is only one factor that limits the unexplored possibilities and it's our imagination, as the potential of this industry is definitely enormous. It is estimated that, in 2020, 30 billion things will be connected to the Internet, which generates revenues of 7.1 trillion dollars (Niemeijer, 2014). Obviously, the upside potential of the IoT is enormous and cannot be neglected, as data from the Deutsche Bank forecast the massive long-term revenue potential of the IoT (Figure 3).

The IoT officially topped out at its peak of expectation inflation. The next step of its development, there is no doubt that IoT has received a lot of airtime, but the question that can be asked here is which companies and industries are actually utilizing it to improve or transform their business models, in comparison of regular Understanding of the business model (Osterwalder, Pigneur, 2014).

The aviation is working strictly intensively to implement the IoT advanced solution for the new business model creation. Rolls-Royce aerospace division with solution named "TotalCare" service offering. TotalCare is a jet engine-as-a-service concept that is offered on a "power by the hour" service agreement model. It enables the airlines to pay for the use of Rolls-Royce jet engines as a function of several service variables, including time on wing, hours flown, and mission type (Hunt 2015). In addition, Rolls-Royce is able to gain all of the costs linked with servicing that are associated with i.e. maintaining its equipment and also tracks the condition of their jet engines with a proprietary system – "Engine Health Management". The implemented in the jet engines technology enables Rolls-Royce to combine all gathered big data

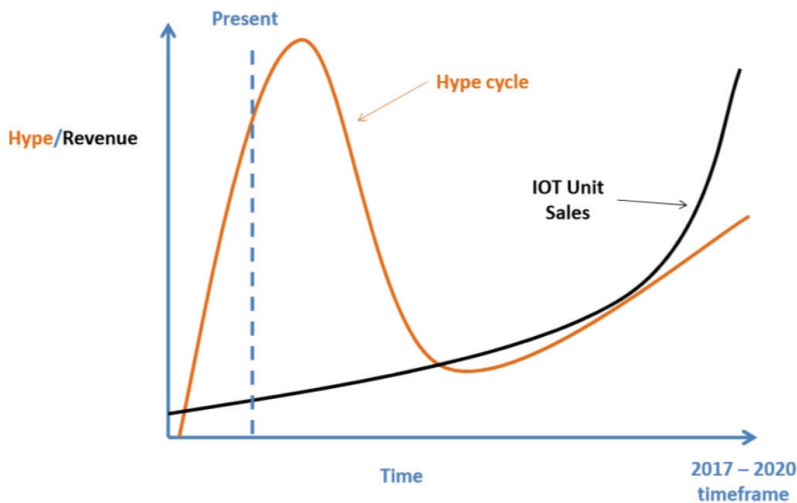


Figure 3. Hyper cycle and Revenue relation in Internet of Things

Source: Deutsche Bank, 2014

generated by thousands of IoT sensors linked and installed in the engine, along with advanced algorithms and predictive analytics to determine when maintenance will be necessary. It reduces operating costs, slashes engine downtime, and also makes the average life of its jet engines up to two times more in the 20 years life cycle.

From a business model perspective, Rolls-Royce use of IoT technologies has enabled a strategic shift from its revenue streams composed of only 10 per cent services in 2010 to roughly 50 per cent services in 2015. This is particularly important, having in mind that that these aftermarket services are high-margin. Rolls-Royce also predicts that total services revenues will be four times higher than original equipment sales revenues. That implicates potentially huge increases in the lifetime value cycle of their jet-powered customers and a big increase to the bottom line (see figure x). In the figure in a typical life cycle of the engine you can see the differences in time between original equipment (OE) and services over the time.

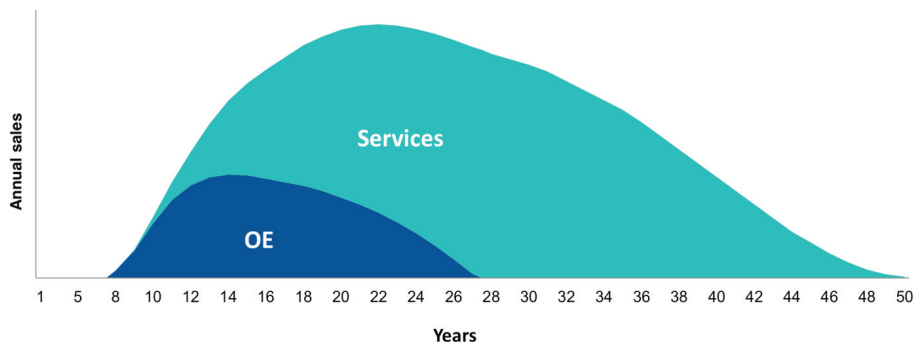


Figure 4. Typical program life cycle: services revenue is at least 4 times net OE selling price

Source: Wood T., TotalCare, Rolls-Royce, 2014

A main key driver of competitive advantage in IoT industries is the first-mover advantage (FMA) (Grant, 2003) associated with collecting and utilizing numerous sources of client's data to optimize products and services before and more effectively than the rest of the competition. In business reality, the data is used to generate from the IoT of product or service development and increase the revenue for the business and decrease the cost on the client's end. Rolls-Royce is at the initial phase of that challenge, but it's also differentiating product portfolio (in jet engines) as an original equipment manufacturer (OEM) by connecting directly 2 ends: the end-users and products with the airlines. This new business model connection point is extremely important because it allows Rolls-Royce to shift so-called traditional jet aircraft manufacturers while creating new connections with their customers, because in the new business model they can share data and engine analytics. Apart from the strategic shift, there is also the costs shift of their engines from one-time, large capital transaction to smaller, recurring expenses, and building their new business model as a responsive, critical factor of logics of production for their airline partners.

Although this business model seems to be successful, based on the Hunt's (2014) analysis, the perception of the first mover advantage concept seems to be understood the wrong way. We can allocate some negative implications of the Internet for profitability. The element that everyone tended to focus on what the Internet in general could do and how quickly its use was expanding, rather than on how it was affecting airline industry structure. Most executives think the Internet would open forces that would enhance airline industry profitability. The general assumption is seen that the deployment of the Internet in a business model would increase switching costs and create strong alliance-network effects (benefits of scope), which would provide first movers with competitive advantages and profitability. First movers in that understanding would strengthen these advantages by quickly making strong new-economy brands. In reality, the switching costs are likely to be lower, not higher, on the Internet than they are for traditional ways of doing business, including approaches using earlier generations of information systems (Porter, 2001). On the Internet, buyers can often switch suppliers, and new internet-based technologies are systematically reducing switching costs even further. The old way of understanding the first mover advantage is should be understood that companies lose control over important elements of their business model, and crucial experience in main it's components, assembly, or services shifts to suppliers, enhancing their power in the long run.

Abovementioned shifts in business model structure and the competitive airline landscape are even more important when we consider the fact that the aftermarket jet engine competitive space is currently growing for a mass-replacement of prior generation model engines, which is taking place from 2016 until now. These shifts are being enlarged to on one hand by the expiring useful lives of many engines (which normally last for 20-30 years), but on the other hand by increased importance now being placed on fuel efficiency, emissions, and noise levels, and CO₂ emission (Hunt, 2014). The Rolls-Royce is already achieving positive influence in this business model engine shift and its replacement phase, especially seen in the cooperation with two most important player in the global sky – Airbus and Boeing.

The IoT has helped Rolls-Royce to transform their old business model by reducing main operating costs and creating the new way of the engine lives with the most

important element – predictive analytics. It also enabled the firm them to sell Jet Propulsion-as-a-Service (PaaS) to the end-users of their main products from the portfolio (Butler, 2013). For the firm, the set of big data and the IoT has driven to new business model innovation (here understood as shift), increasing customer lifetime values cycles and shifting revenue streams from 10 to 50 per cent services over the past decade. The most significant evidence of that shift can be seen in differentiation of their products and services in the extremely competitive after-market jet engine airline industry. The main competitors (i.e. Pratt & Whitney) are also building out their Jet Propulsion-as-a-Service offerings through a partnership global IT firms and it opens up an extremely inspiring field for analysis of airline market competition combined with market share as airlines around the world make their jet engine replacement decisions in the coming years.

CONCLUSION

For many years, the introduction and growth of platforms to be used by end customers (or as passengers) has been based on transparent understanding about cost, routes, global alternatives, and required travel time (Santo, 2016). That mode of operations was necessary to increase the growth rate of low cost carriers and for questioning the traditional business model of legacy airlines and also shaping their future business models. New business models will come, but we find ourselves in a post-revolution era of Industry 4.0 implementation, linked with growing significance of the IoT. There are good opportunities to take ideas from global applications of Industry 4.0 and use them in aircraft production. In particular, the use of tools for customer-specific options could be reduced by software-driven solutions and intelligent implementation of laser pointing mechanisms. Although 3D printing offers outstanding potential to provide more customer-related solutions by managing these options and the complexity by applying Industry 4.0 solutions, we are still at the introduction phase of the future advanced Industry 4.0 solutions.

This paper identifies various factors and drivers of shift that need to be considered in global decisions that shape the future of the airline industry and also the lives of the millions of travelers that depend on it. One of the most important finding of this theoretical and practical analysis is linked with the impact of the industry 4.0 and Internet of Things in shaping future business model and also the scenarios on the horizon of aviation in the next decades. The scenarios provide some general understanding of scale of the changes that will be linked with aviation, but although the data shape some future trends it might be almost certain that next decades will be very different from today's reality.

The aim of the research paper had to identify the future forms of leading the aviation firms, and although we can look at changes in the organizational environment it's hard to say if the changes we are talking about are linked with growth or decline. It's a very common mistake to look at industries in that narrow perspectives. That happens usually because we try to foresight the future trends and scenarios using historical data, and it might be possible that that part of historical data will be irrelevant in the coming future. That is why we need to take into account two other possibilities that can shape the future way of leading aviation firms. It can be shaped by external environment signals and so-called constraints that either stop or boost the future way of competing, but most probably we should focus of the last scenario

– the transformation. It might be possible that the question that we ask about the aviation industry today, are far away from what we will be expecting from that sector in the future. Transformation addresses and answers therefore this incredible shift that touches – even today – the life of aviation industry organizations and the entire aviation sector at the same time.

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