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Report: Airbus A380 Case Study

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Colossal Aviators

ABSTRACT

Airbus A380 is the largest passenger aeroplane in the world and this report covers brief details of the entire project of A380. This report analyses the project management aspects of Airbus' A380 as well as key project issues faced by the project. Background of A380 is detailed with initial phase of project continuing with project objectives and its strategic importance to outline the foundation. Further, project methodology for A380 is discussed describing the adopted methodology and its limitations, additionally, recommendations are drawn. To analyse the project management insights of A380, few tools are incorporated to major project success which can support the key issues discussed further. Firstly, a brief discussion of diamond model against triangle model is drafted to critically examine the efficiencies of both the model. Secondly, the success measures matrix has been included to analyse the record of accomplishments of A380 project analytically. These model-based analytical description are included to examine project's success and further the theoretical causes of A380 downfall. Intensive research has been carried out to study the issues in A380 project, which led to a list of twenty-two issues, which then were segregated based on different phases of project management. Hence, three significant issues are finalised in which inappropriate project planning issue and associated causing elements is discussed in the video presentation, while other two issues namely, risk-assessment & execution failure and project controlling & monitoring issues are discussed along with elements of causes in this report precisely and analytically in detail. Furthermore, practical recommendations are described aligning with the two described issues which are based on improvements and implementation to reduce the extra-costs so that this project can escape loses and failures. This profiles extensive description of A380 project by using efficient project management tools, framework, and methodology, in addition, the observation of project management issues and outlining recommendation to understand how project management knowledge and analysis can evolve to provide solution for the issues faced by Airbus for their gigantic flight ever.

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1. Introduction

This report examines the processes, tools, technologies, and implications of project management through an exploration of the Airbus 380 project, discussing the management challenges encountered and offering practical recommendations for the process.

2. A380 Background

Airbus is a European aeronautics manufacturer headquarters in Blagnac located in the outskirts of Toulouse city, France. Airbus manufactures more than 50% of the airliners produced worldwide and therefore, competes with Boeing (Forsythe, 2005). The foundation of Airbus as a consortium was laid in the late 1960s followed in 2001 Airbus Industry became a subsidiary of EADS (European Aeronautic Defence and Space Company) which then renamed to Airbus Group in 2014 and finally as Airbus in 2017 (Goldstein, 2018). The very first aircraft by Airbus, the A300 was produced in 1972 continuing further with a range of commercial aircrafts from the A318 to A380.

2.1. Project Objective and Scope

Airbus's A380 is the world's largest passenger aircraft, and this project was planned to address the vast market of aircrafts and to disrupt the monopoly of Boeing 747 (Goldstein, 2018). The A380 is indeed a "Superjumbo" in every aspect, as detailed by Zhang in 2017, it is the most expensive and lavish airplane in the world with the price of 436 million USD which can provide room for 800 passengers. A380 has double-decker's sheer size which is so enormous that its arrival becomes an occasion.

2.2. Project Organisation

The production activity of A380 was organised and managed on an international scale with a dense network of firms from different states of the continent, however the final assembly was carried out in France. A380 has reported investments of more than €14 billion. Shortly post the launch, the A380 proved to be gaped for its fuel efficiency. Airbus also states that the A380 is an engineering marvel with lower emissions which are significantly below international guidelines: NO_x being 30% below CAEP/6, 16.4 EPNdB noise margin, 33% exceeded fuel burn and lesser CO_2 emissions in comparison to older versions (Airbus).

2.3. Strategic Importance of A380

The designing of superjumbo was prioritised with everything that made Boeing 747 a glyph and further evolved the specifications to the crest of modern engineering and design. In 10-seat configuration of A380, the average seat is 19 inches wide as comparison to 17.5 inches in the Boeing 747 (Goldstein, 2018).

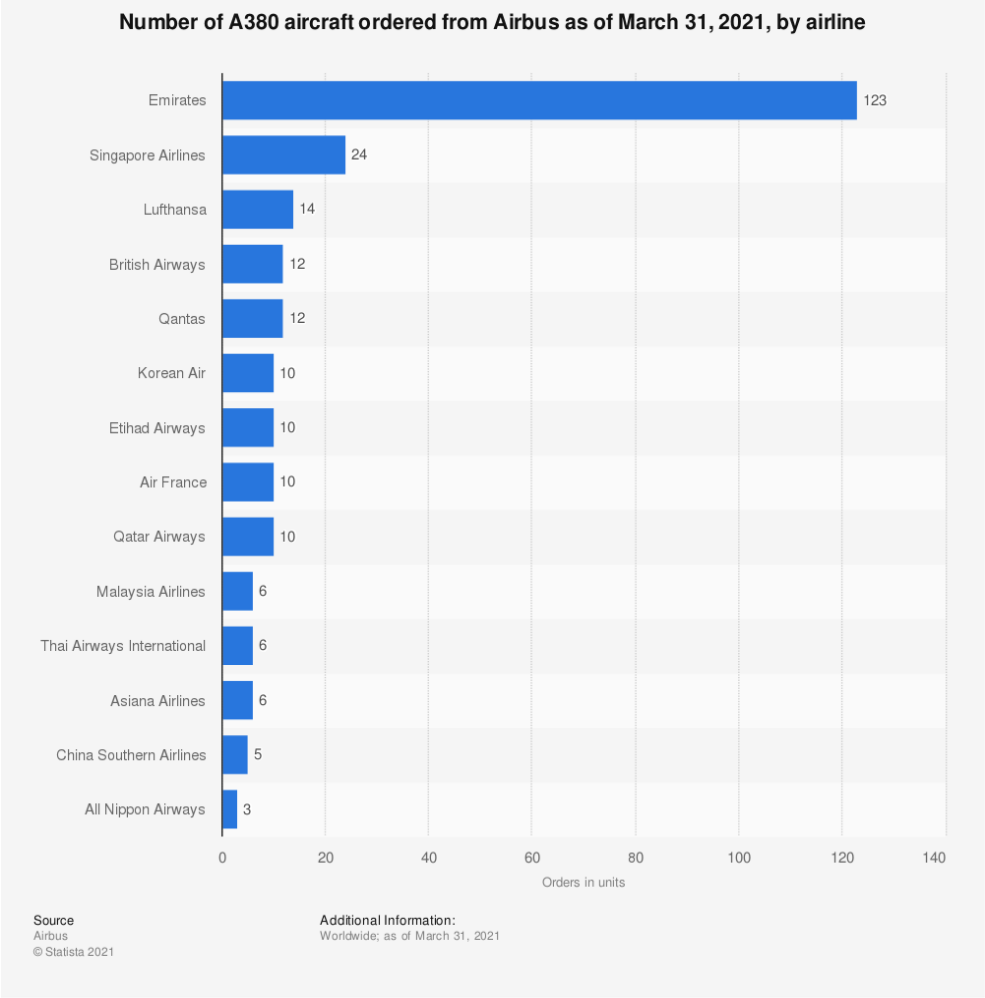

Figure-1: Number of A380 aircraft ordered till 31-March-2021 (Source: Statista, 2021)

Emirates was the largest customer for A380 followed by Singapore Airlines, Qantas and British Airways. Emirates ordered 123 A380s close to 50% of total A380 aircrafts sold however the initial orderbook was of 162 jets (Airbus) post agreement to buy other jets. Currently Emirates operates 108 global destinations in which A380s cover close to 50 global destinations. This is very evident that A380 has not only taken the market share from its rival globally but A380 also has made new demand and thereby covered most by itself. It is quite uncertain that Emirates could have achieved this much without the A380 fleet.

3. Methodology

Characteristics pertaining to the Waterfall methodology are evident throughout the project management process of the A380. Comprehensive documentation is an element of waterfall, “The Airbus A380 has over 4 million parts that come from 1,500 companies across 30 countries/the Airbus A380 could be considered one of the greatest feats of portfolio, program, and project management ever.” (Nelson, 2020, p.11) A megaproject such as the A380 required immense detailed documentation and critical communication, to ensure the project continued to develop and any regressions to the progress could be quickly identified and rectified.

The development of the A380 boasts further examples of the use of Waterfall, with the use of an autocratic yet decentralised management style. “From the day of its inception, Airbus had a dual management system which led to open national rivalries between France and Germany for Airbus control.” (Naikal, 2022) This management style, whilst led to rivalries, the project was still completed and helped unify international relations. This suggests the Management team should have utilised a more traditional single management structure capable of delivering instructions without complication by another management team.

It is important to reiterate the A380 is a project of monumental scope, “these large-scale projects are established as an autonomous organisation during the existence of the project.” (Sato and Milton, 2014, para 1) Due to the immense scope of the A380 project there were a multitude of different elements from different methodologies used.

A more cohesive blend of methodologies used would have best served the success of the project. Taking elements from SCRUM methodology could have benefited the project, as SCRUM possess characteristics that encourage collaboration and have an adaptive perspective to change. However, the forced malleability to the waterfall management style resulted in the project, still being completed but in a partial state of disarray “The various Airbus locations had their own legacy software, methods, procedures, and Airbus never succeeded in unifying all these efforts” (Naikal, 2022).

A hybrid methodology is recommended so that the project can have the features like flexibility and adaptability to the frequently changing market. Additionally, adopting appropriate risk management strategies to avoid the unnecessary errors that can be occurred in each stage.

4. Project Management Tools/Frameworks

4.1. Triangle Model v/s Diamond Model

One size does not fit all, so the underlying notion of 'a project is a project is a project' is flawed (Orhof et al., 2013). It is essential to understand that projects are different from one another and to critically decide the success measure it is important to define the framework correctly. The fundamentals of project management state that there are three factors time, cost and quality that judge if a project is a success or a failure (Malcolm Bronte-Stewart, 2015). The connection between these parameters is represented as the 'Iron Triangle'. Although the Iron triangle is a useful measure it is proven in past that a project can fail these specifications and still be a success. This is true for Airbus A380 as well.

For A380, Shenhar and Dvir's (2007) NTCP 'Diamond' framework is one of the most eloquent ways for classification. The four-diamond dimensions are defined as(Orhof et al., 2013):

Dimension	Description	Level	Challenge
Novelty	Degree of how new the product is to consumers/market.	2-3	Airport fit & Regulations
Technology	Extent of use of innovative technology.	3	Advanced machinery
Complexity	Measures the complexity of the project.	2	Integration
Pace	Criticality of the completion time.	2	Competitive space.

Figure-2: Dimensions of diamond model for Airbus A380.

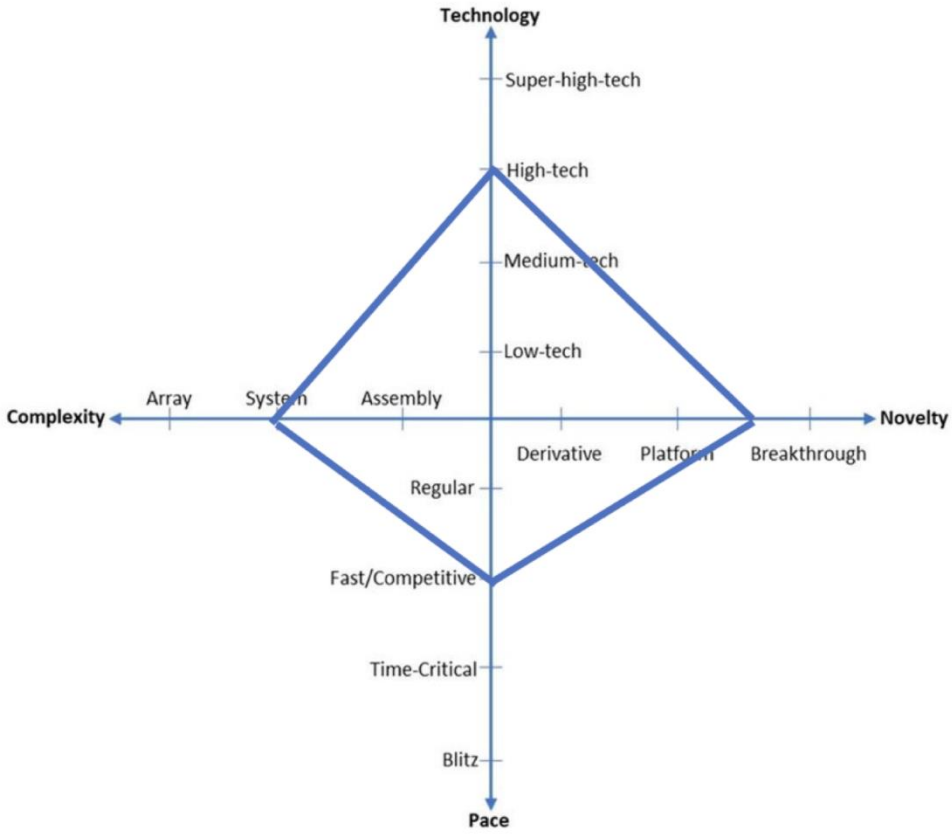

Figure-3: Diamond model for Airbus A380.

The diamond model offers a tool to measure the project's benefits and risks. It also helps to select the right management approach (Shenhar, Dvir, 2007). It is useful for adaptive planning and can also help in putting a project back on track (Shenhar, 2012).

The success of any project highly depends on initial clarification. It can be challenging to define these dimensions as there is no defined criteria or algorithm to classify them.

And hence as recommendation, in addition to the NTCP model, to counter the unprecise measure of the dimensions, the Object process methodology (OPM) seems highly suitable to be bridged along.

4.2. Success Measure Matrix for A380

The success of a project can be measured against the Success Measurement Module, which covers efficiency, impact on the client, impact on the team, operational and direct success, and preparation for the future.

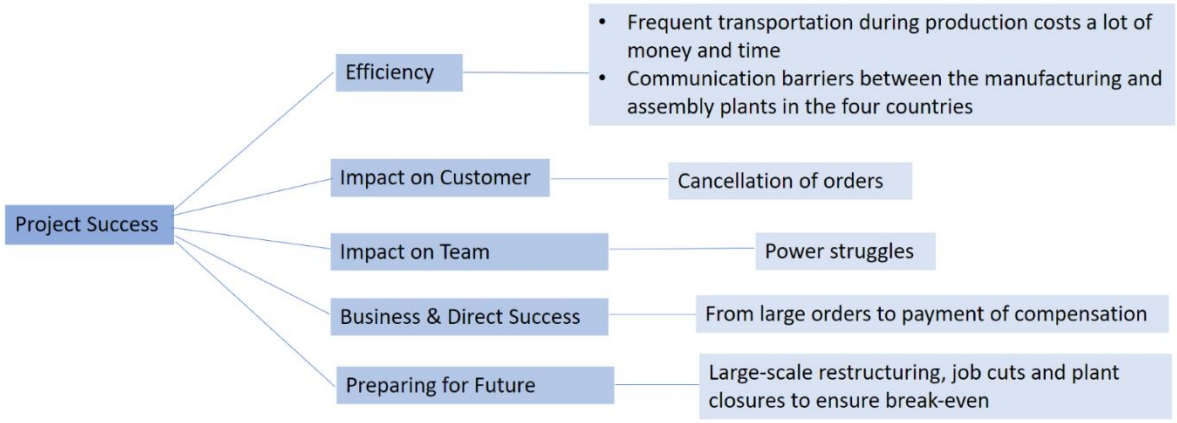

Figure-4: Success matrix for A380

The efficiency of a project can be assessed by how well it meets the original schedule and budget, or how much change and benefit there is to the project. In the case of the Airbus 380, the A380 was tendered globally, with components coming from hundreds of manufacturers in over 40 countries and production spread over 16 factories in four countries. In this case the A380 production process required frequent shipments, which cost a lot of money and time, resulting in the A380 project being constantly overpriced.

The impact on the customer can be evaluated in part by how well the project met the needs and requirements of the customer. The lack of supervision of the program resulted in three delays and several purchasers, including Singapore Airlines, Lufthansa and Emirates, made claims against Airbus for compensation or cancellation of orders (BBC,2006).

The impact on teams can be seen through team satisfaction and morale. In the case of the Airbus 380, the immediate cause of poor communication was the odd organisational structure within the project team. Despite the joint participation of four countries, the shareholding structure of Airbus is in fact a huge French-German dual-control combination (The New York Times, 2006). This has led to a hierarchical approach to decision-making, all of which makes team communication extremely inefficient.

Commercial and direct success can be demonstrated by project sales, profits and cash flow. the Air bus 380 went from a large initial order book to many backorders at the end, until production was completely discontinued in 2019, reflecting the unsatisfactory quality of service.

In the element of preparing for the future, Airbus had to carry out a major restructuring and layoffs to maintain break-even and secure the company's cash flow.

5. Key A380 project issues & causing elements

Issue analysis led to several elements, so three issues, inappropriate Project Planning (video-presentation), risk assessment & project execution failures and project monitoring and controlling issues, were selected depending on project phases and further detailed with causing elements in the following sub-sections.

5.1. Risk assessment and project execution failure-issues due to dynamic aviation market

5.1.1 Introduction of Low-cost airlines and demand of mid-size aircraft

Low-cost carriers were emerged in number of countries across the globe which firstly led by Brazil and South Africa (Francis et. al., 2006).

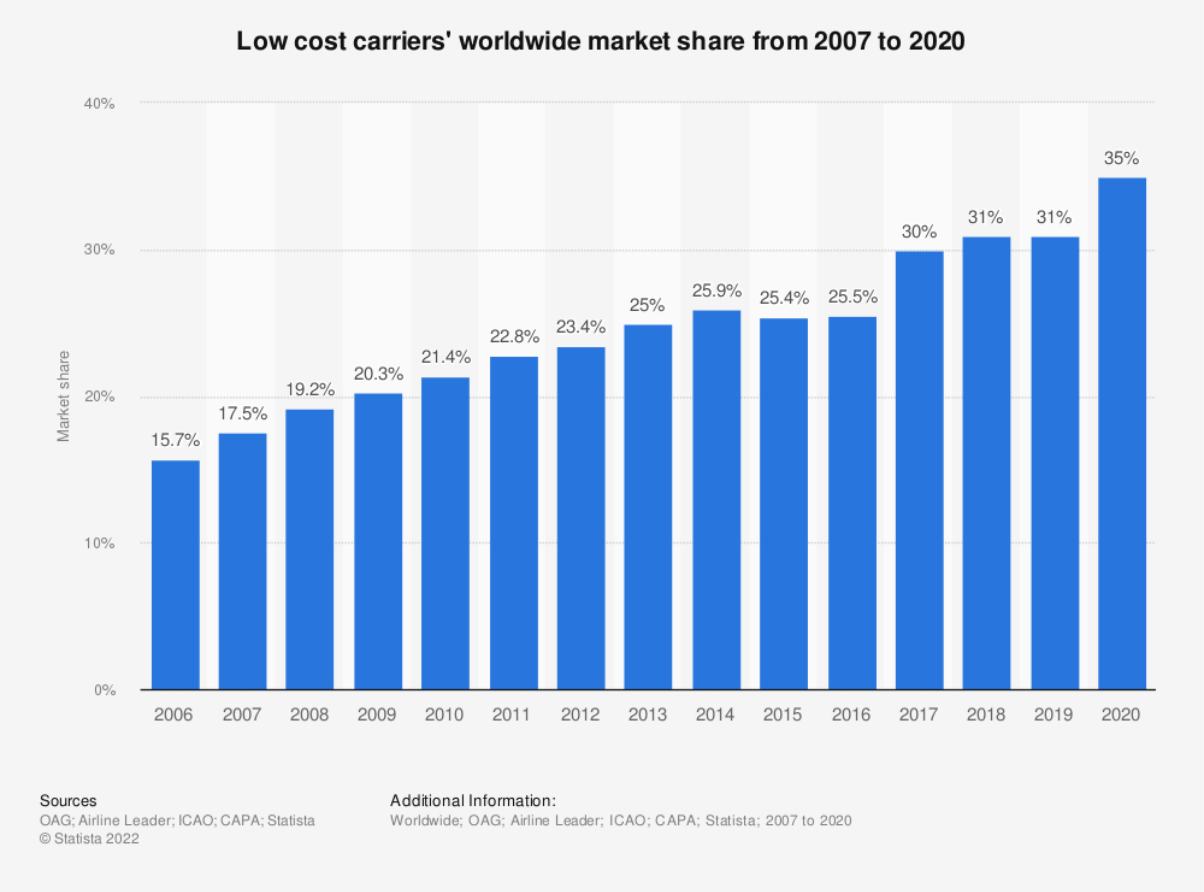

Figure-5: Lost cost carrier market- global capacity share 2007-2020 (*Statista 2022*)

Furthermore, the time span witnessed multiple catalysts for the expansion of low-cost airlines which were deregulated market, entrepreneurs, population and relative wealth and airport availability to allow intensive operations. Though A380 can be carried by low-cost carriers which can operate the aeroplane with a single economy configuration, but it was understood that filling 800 and more seats would never be easy.

Meanwhile the upsurging demand of mid-sized aircrafts due to passengers preferring direct flights became another affecting factor. Moreover, Airbus itself has seen this demand and thus its other aircrafts had the scale in sales to fulfil requirement in the market.

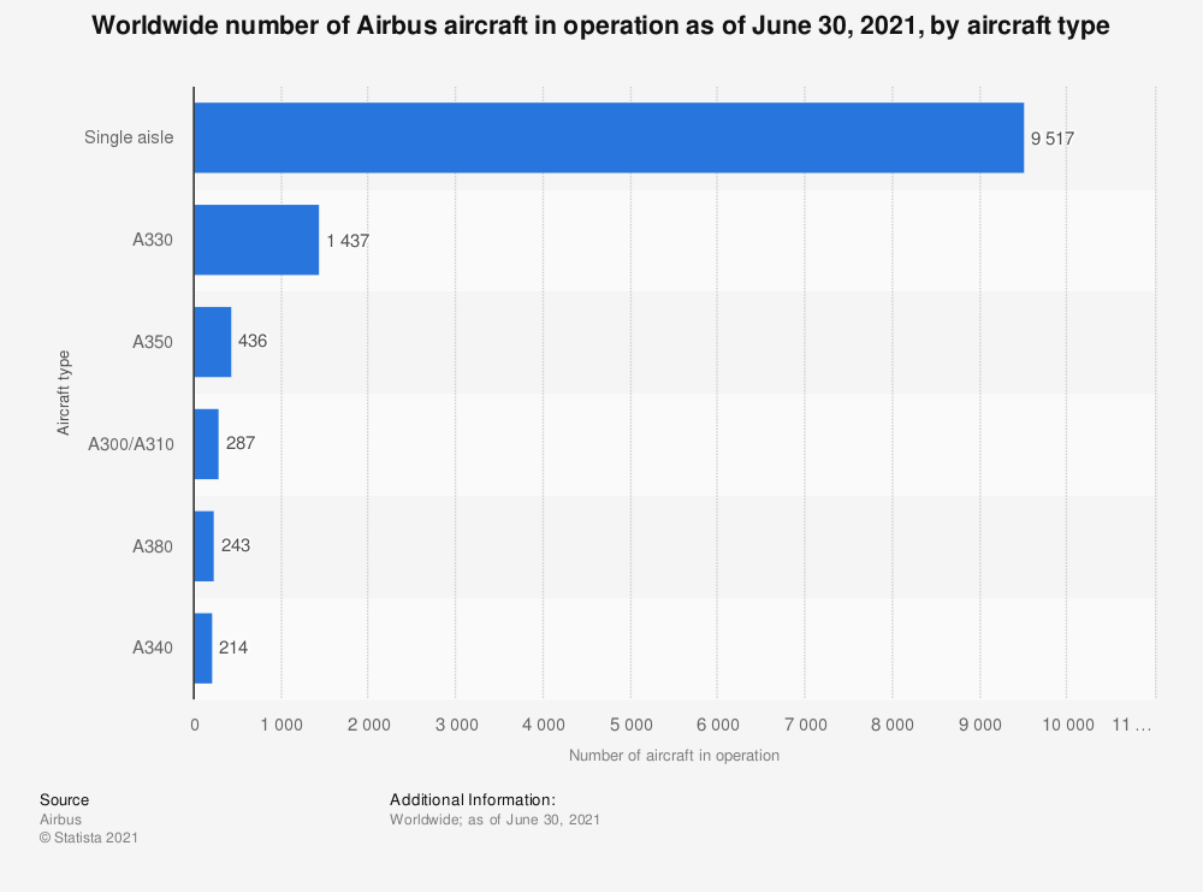

Figure-6: Shows various Airbus aircrafts in operation as of June 2021 (*Source: Statista-Airbus 2021*)

This can easily answer why the biggest customer of A380, Emirates called for reducing its order of A380 from 162 to 123 aircraft (Airbus 2019).

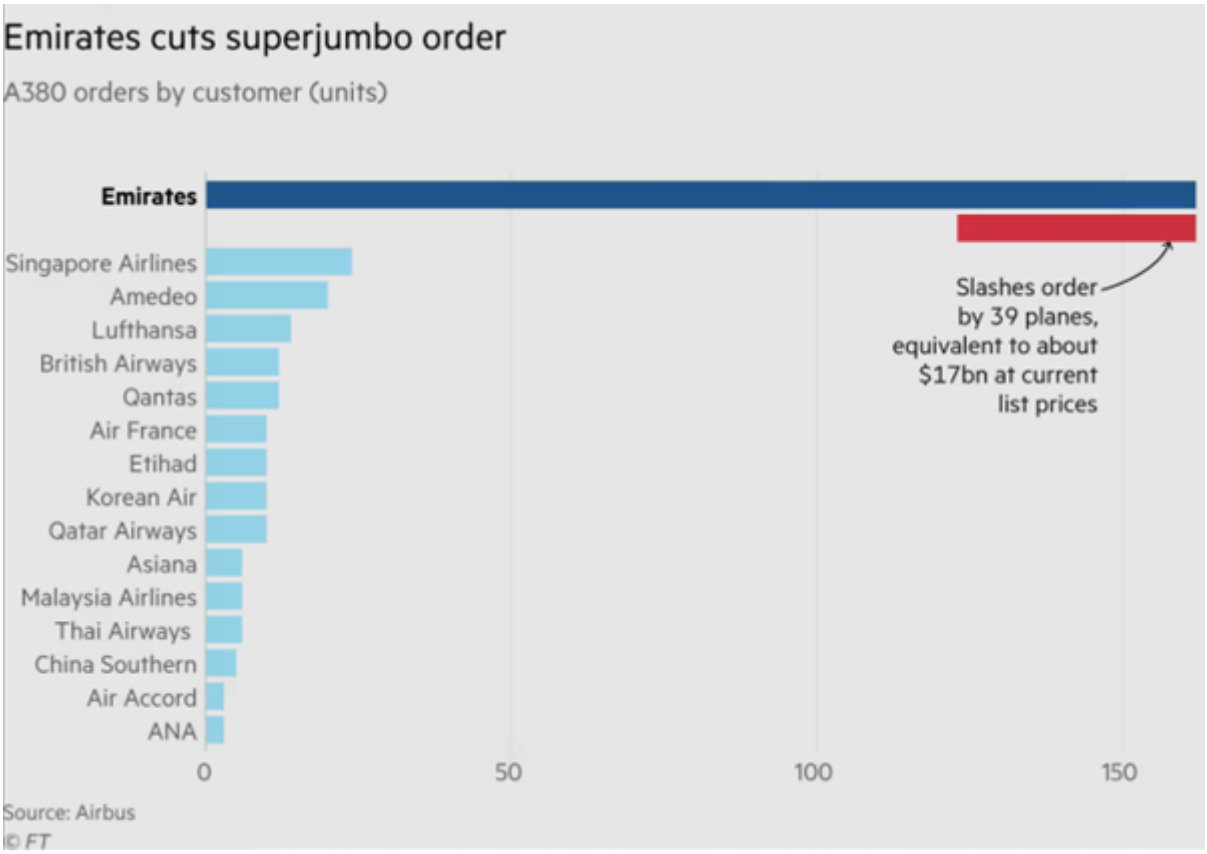

Figure-7: Emirates reduced its orderbook from 162 to 123 A380 aircrafts (Pfeifer and Kerr, 2019) (*Source: Financial Times*)

5.1.2. Airport infrastructures

The breadth and height of A380 is even more than Boeing 747 and so A380 will be able to use most of the airports without specific investments however this will cost in terms of restrictions (Forsyth, 2005). Restrictions as other users are not able to user the nearby runways while A380 landing or taking off, since A380 requires some space during taxiing which can limit other aircrafts. Additionally, A380 needs extra spaces at the gates, and this affects the neighbouring gates in operation. This add-ups struggle for the airports to handle the traffic and affects capacity management. Hence, it can be understood that operating A380 also adds up cost for the other users at an airport.

Cost of Investment to Handle Airbus A380

Airport	*Cost*
New York Kennedy	$US109m
Los Angeles	$US177–1215m
Atlanta	$US25–26m
London Heathrow	£450m ($US823m)
Frankfurt	€150m ($US194m)
Melbourne	$A50m ($US38m)

Sources: GAO (2002, Appendix V) — New York, Los Angeles, Atlanta; Rozario (2004) — London; Airport Media Announcements — Frankfurt, Melbourne.

Figure-8: Cost of Investment to Handle Airbus 380 (Forsyth, 2005).

Also, with the rise of regional and small airports, it is quite expected that upgrading for these airports would be difficult. So, the airlines which earlier used to favour big hubs are moving towards mid-sized airports with direct flights. Implementing a solution for this cost eventually was not easy, since airports were forced with two factors which are extensive investments and upgrading the airport for operating A380 (Forsyth, 2005). However, it was seen that most airports are on the side of making extensive investment and pass the costs on the users. Therefore, the cost of accommodating A380 will be incurred by the airlines and other users at the airports which are passed on to the passengers.

5.1.3. Fuel dependency:

Airbus A380 showed several community benefits such as noise footprint was halved from previous generation aircraft, lower emissions and 33% better fuel burn. Although A380 had effective benefits but the superjumbo with four engines is said to have 24% less efficiency than the one with two engines (Rutherford, 2018). According to Rutherford (2018) A380 is not going to pass the International Civil Aviation Organisation's aircraft CO_2 standard and therefore if the fuel efficiency will not be improved then Airbus will not be able sell given that Emirates as a single customer wants the production line to survive.

Figure-9: Industry average fuel efficiency of 14 aircrafts on transpacific routes 2016 (Rutherford, 2018)

Fuel dependency always remain a factor for all aircrafts, but improper risk assessment led A380 to suffer. The fuel consumption and shortages are known since long and hence, it is a matter of severe risk. Moreover, Airbus A380 has been estimated to be in the range of $26,000 to $29,000 per hour using $17,467 of fuel (Goldstein, 2018) compared to Boeing 787-9 which has an estimation of $11,000 -$15000 per hour of operation. With fuel shortages and sustainability requirements, A380 execution phase suffered the excessive costs of operation and therefore, it was challenging for smaller airlines to purchase any of A380 and operate the superjumbo.

5.2. Project Monitoring and Controlling issues

5.2.1. Reliance on Hub-Spoke model:

Hub-Spoke Model is quite evident in aviation sector, where hub being a central airport and spokes are the routes, the flight takes out from the hub and vice-versa. A380 being huge and with enormous space capacity runs on hub-spoke model since it is easier to carry more crowd from the central airport to another major and majorly indirect journeys with stops.

Figure-10: Thai Airways International Airbus A380-800 hub-spoke reliability (Baxter et. al., 2018)

Since this model is centralised and hence, the operations become more inflexible. Passengers opt more for direct flights; delays are more prominent as well as the congestion and crowded hubs are never a choice for many passengers. Moreover, A380 can be considered for point-to-point operation, however flying with optimal seat capacity for direct routes could be difficult and if seats are not much sold then fuel economy and other cost can extensively increase.

5.2.2. Unprofitability and declining orders

The fund and cash flows for A380 project were directed from other profitable line such as A320 (Nikolaishvili and Chama, 2007) while the EBIT (earnings before interest and taxes) share from A380 was quite low. It was 1919 million in 2004 and 2307 million in 2005 which undergoes a radical drop of earnings to -572 in 2006. During an interview Tom Enders said that with the situation that Emirates reduced its A380 orders, the backlog was not much sufficient for the production to continue.

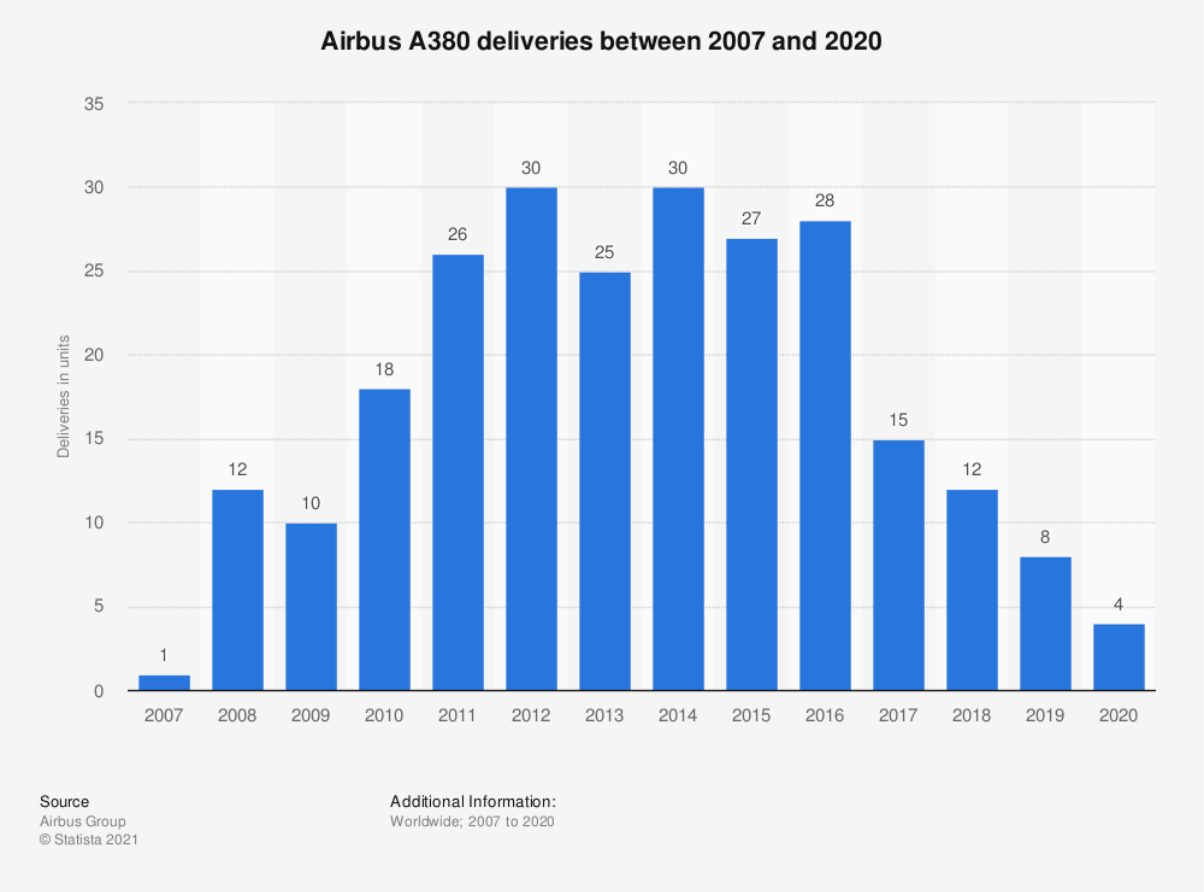

Figure-11: Airbus A380 deliveries between 2007 and 2020 (*Source: Statista, 2021*)

Airbus A380 orders started declining in 2015. John Leahy, Chief Commercial Officer declared that if Emirates did not order at least 30 more of A380s, then the program survival would not be possible (Reed, 2019).

5.2.3. Power struggles & strange organisational structures

The organisational structure of Airbus was quite complex and so affected the gigantic superjumbo manufacturing, production as well as management internally (Nikolaishvili and Chama, 2007). The differences in manufacturing technology between the countries were not considered. For example: It was not until the plane was finally assembled in the French main factory that the engineers of the two countries realised that the software systems used between them were surprisingly incompatible. The French engineers used the Dassault "Cati 5" software system, while in Hamburg an earlier version of "Cati 5" was used (UBC,2022). The replication of production unit does not allow EADS (European Aeronautic Defence and Space) to advantage, but lack of coordination resulted in inefficiency and extra cost add ups.

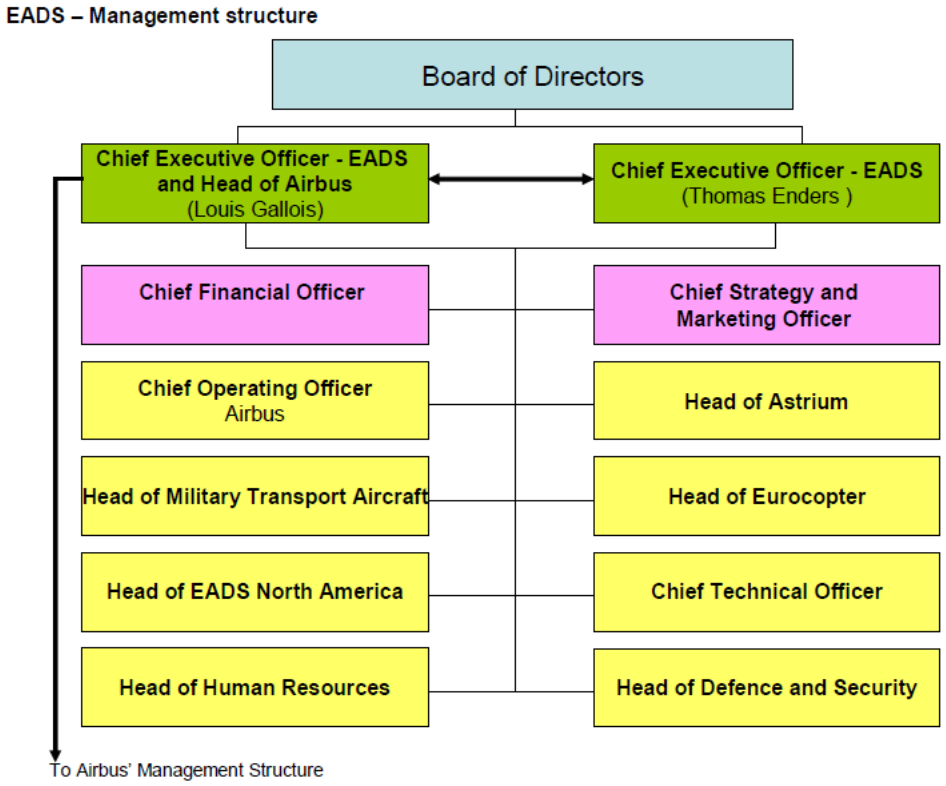

Figure-12: EADS management structure followed by Airbus management structure (Nikolaishvili and Chama, 2007).

The Airbus's corporate structure is complex and not flexible, therefore, faces several geo-political issues. Frequent changes in project management team reduced the project's resilience to risk. A380 was destined to suffer since inappropriate management strategy and leadership make it difficult to track and change during monitoring and control phase.

6. Recommendations

6.1. Based on project execution and risk assessment failure issues

(Adler and Gellman, 2012) Excessive consolidation in the aviation business may result in higher prices and lower service levels, necessitating the use of a profit-maximizing strategy. When there is Destructive competition, the project should be actively monitored, and a smart fleet renewal/purchase plan maintained. When cross-subsidization between commercial and aviation operations results in the transfer of consumer surplus to airlines, apply ex-post anti-trust law, RPI-X price cap for local geographical monopolies. Focus on the current system's

stability, which is vital for the business environment, and actively keep an eye out for predatory pricing behaviour when there is political pressure to reregulate airlines.

The risk in the aviation sector is also influenced by fuel economy, which must be minimised. (Husse, 2006) Unfortunately, there is no secret formula for limiting dependency; only well-established practises and procedures will work. The approaches that can be used are use of efficient engines, improved aerodynamics to reduce drag thereby reducing fuel use, reducing the addon-weights of A380 by better seat configuration and luggage handling, computerised flight plan and operating with minimal take-off altitude.

6.2. Based on project monitoring and controlling issues

The research proves that monitoring progress towards targets is an effective project self-regulation strategy and that interventions that increase the frequency of progress monitoring may promote behavioural change (Harkin, Webb, Chang, Prestwich, Conner, Kellar, Benn and Sheeran, 2016). Therefore, during the operation of a project, leadership should better monitor progress to identify obstacles that may arise. This can be addressed in a timely manner.

In addition, according to Gill's research (2002), it is equally important to successfully introduce and maintain effective leadership when changes occur in a company. Therefore, management stability is also critical to the success of a project as one of the reasons for the failure of the A380 project was its frequently changing leadership (BBC,2006).

7. Lessons and Conclusion

In conclusion, this report explored the project management of the A380 through different project management tools including the Triangle Model, Diamond Model and Success Measure Matrix. Secondly, it identified the project management methodology adopted for the A380 project as Waterfall, and critically analysed the strengths and weaknesses of this methodology.

Finally, the report identified two project management issues for Airbus on the A380 project. One is risk assessment and project execution failure, where changes in the aviation industry such as the rise of low-cost carriers, airport infrastructure, demand for medium-sized aircraft and fuel dependency have made it impossible to resist and deal with risks during the execution phase.

The other is the issue of project monitoring and control. Unprofitability and reduced orders as well as power struggles within the organisation were the main factors affecting the monitoring and control of the A380 due to the reliance on the Hub-Spoke model and the non-investigation of alternative approaches. And in the end, it provides solutions and recommendations for the project that will hopefully help to avoid similar management problems in the future.

At the outset, the A380 was designed to capture a different market to the medium-sized aircraft. If the risk analysis was done sufficiently well, then the A380 could survive in the niche market in which it was intended.

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Appendix-1: RACI Matrix

For clear table please find the excel file “Group-27 RACI Matrix” uploaded in the submission.

Project Tasks	Project Manager	Project Team Members					
	Tilakraj Nayak	Akanksha Jha	Divyanshu Pandey	George Brown	Joel Tom Panjikkaran	Shengqing Yang	Chaitanya Singh
Initiation Phase							
Project Selection	R	C	I	C	I	I	C
Group Formation	R	A	I	A	A	A	A
Group Name & PM (Project Manager) selection	R	A	I	A	A	A	A
1-pager summary of Project Plan	R	C	I	C	C	C	C
Planning Phase							
Background Analysis & Research	R	A		A	A	A	A
Researching A380 Issues	R	A		A	A	A	A
Literature & Quantitative Research	R					C	C
Gantt Chart	A			R			
Writing Phase							
A380 Background	R					C	
A380 Issues	R					A	I
PM framework: Success Measure Matrix	I					R	
PPT for Review Meeting (with Jens)	R	C		C	C	C	C

PM framework: Triangle/ Diamond Model	I	R					
Methodology	I			A	R		
RACI Matrix	R	I		I	I	I	I
Recommendations	C					R	R
Video Preparation Phase							
Content for Video	R					A	R
Video creation	C	R		R		I	
Assignment Finalisation Phase							
Report final draft & proofreading	R	C	I	C	A	R	C
Video presentation final	A	R	I	R	A	A	A

Responsible
Accountable
Consulted
Informed