

Grounded: A Management Assessment of the Complex Berlin Brandenburg Airport Project



A Project Management Case Study by:
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1. Introduction

1.1 Overview

Berlin Brandenburg Airport (BER) has become the German capital city's largest airport, with a passenger capacity of over 40 million a year [1] and is a symbol of Berlin's emergence as a global hub [2]. The airport has also set new standards in functionality, including one of the most efficient automated baggage systems in the world [3] handling up to 7000 bags an hour, and in sustainability including features such as rainwater infiltration [4]. The airport also employed flexible design principles, with terminals 1, 2 and 5 initially constructed, but with the option to expand to terminals 3 and 4 if there is a significant future demand growth [5]. The original scope of the project aimed to replace Berlin's 3 outdated and over-capacity airports (Tegel, Schönefeld, and Tempelhof) with one modern airport to efficiently deal with the passenger demand and act as a focal point for connecting flights in Europe [6].

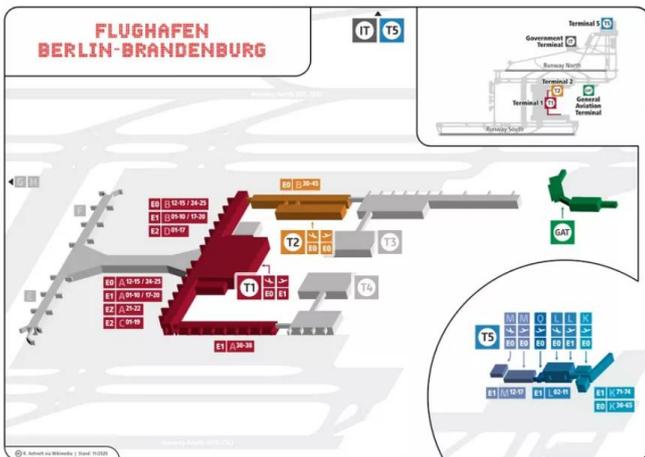


Figure 1 - A diagram of the Airport Terminal Plan [5]

However, despite its eventual impact in Germany, this project has been categorized as one of the biggest engineering and project management failures [7], causing severe budget and time consequences. The airport was originally planned in 1990 [8], with completion of the project expected in 2011 and a budget of €2 billion. However, the project was finally completed in 2020, 9 years late, and at a sum of €7 billion [5], more than triple the expected cost.

The BER project management failures were so vast that there were several issues in every one of the PMI's 10 Project Management Body of Knowledge categories [9] as detailed in the summary section. One key issue was the severe lack of communication and integrity from the leadership team, with 4 CEOs over the course of the project, and senior internal stakeholders that were guilty of lack of qualifications, withholding information [10], as well as corruption [11]. Due to this poor management, the project was reported to have over 120,000 defects [12] including automatic doors lacking electricity, a roof with twice the authorized weight; and

ordinary walls billed as firewalls. Correcting these led to the ballooning of the project costs and timeline.

This report details the specific project management strategies employed over the entire project lifecycle, from the initial planning of the airport in 1990 until the completion of the project in 2020 that affected the project's success. The analysis includes the business case, key stakeholders, time-planning, project organisation and risk management. The most significant aspects that caused the project to deteriorate are then evaluated, specifically stakeholder management, risks, communication, quality control and time. To conclude, key learnings from the project are constructed to provide insights and suggestions for future construction projects of a similar nature.

2. Project Analysis

2.1 Business Case

The fall of the Berlin wall in 1989 led to a united Berlin served by three airports, Tegel in the east, Schönefeld in the south and Tempelhof in the centre of Berlin. These ageing airports were outdated and too small to cope with Berlin's increasing air traffic. Hence, to replace them government leaders decided to build a single, high-capacity airport that would increase worldwide access to the city of Berlin and the province of Brandenburg [6]. During the planning stage, it was predicted that by 2023 Brandenburg Airport would be handling 360,000 flights and 30 million passengers indicating the need for a contemporary airport [13].

The building of the airport was not only of economic importance but of significance for Germany. With Berlin once again declared the capital city in 1990, the Brandenburg Airport provided a large infrastructure project to re-establish and rebrand the city [14]. Situated to the South of Berlin, a site next to Schönefeld airport was chosen as the site for Brandenburg, with the project expanding the original airport by 9.7km² [8]. This decision proved controversial as out of the 7 possible locations; politicians picked the Schönefeld site despite this meaning upwards of 80 million euros needed to be spent to relocate an entire village. In 2023, the connection of the airport is demonstrated through its access via car, bus, and regular train services taking 30 minutes to reach Berlin city centre [15] [16].

It was also intended to be utilized as Europe's main connection airport, with a large terminal building filled with shops for passengers waiting for connecting flights. However, as discussed in section 3.1, the main airline based in Berlin 'AirBerlin' ceased operations in 2017 casting the connection functionality of the airport into

doubt and was a consequence of the airport's delay [17].

2.2 Stakeholder Analysis

The Brandenburg Airport was a government project owned and coordinated by Flughafen Berlin Brandenburg GmbH (FBB). FBB shareholders include the State of Brandenburg and the State of Berlin with equal shares of 37%, along with the Federal Republic of Germany with the remaining 26% share [18]. These are the project stakeholders with the highest interest and power as they control the project and future operations of the airport.

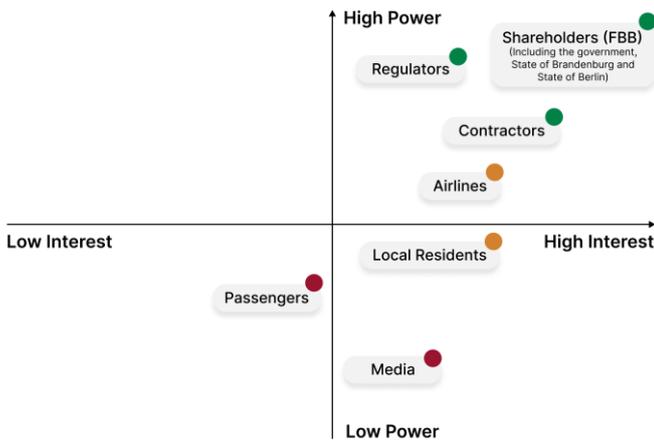


Figure 2 – Airport Stakeholder Power Interest Matrix

Large-scale public projects such as this often have numerous external stakeholders with high power and interest. Regulators such as the Aviation Authorities are high-power stakeholders as they were responsible for issuing planning permission for the initial construction of the airport and the certification to begin operations of the airport [19]. Other regulators, including the building and safety authority, also have the power to stop construction and prevent the operation of the airport if certain features do not meet safety standards.

The FBB commissioned Planungsgemeinschaft Berlin-Brandenburg International (PG BBI), a joint venture of 3 Architecture firms, as a general planner and to prepare documentation for the general contractor tenders. These planners and contractors had high interest and power in the project, as they were responsible for the execution of the design and building of infrastructure. However, with most of the contractors agreed in 2009 [20], this was a major factor in the delay of the project as discussed in section 3.5.

Other stakeholders such as airlines, and train lines had a significant interest in the project to ensure that the infrastructure being built was compatible with their services. For example, airport jetties for different airline planes were being designed and requiring the correct length and height of railway platforms. Passenger

stakeholders have an interest to the extent of being able to navigate through the airport and efficiently catch their flight. Passengers have lower power within the matrix, as they have minimal consultation on the build and structure of the airport [21].

Residents forming community groups can have some power, but all have a high interest in the matrix due to their proximity to the airport and the negative effects it can bring, such as noise pollution. The flight path for Brandenburg Airport was controversial as planes would fly low over the Berlin suburbs impacting the environment and noise pollution. However, protests from local communities forced the evaluation of the proposed routes [22] [23].

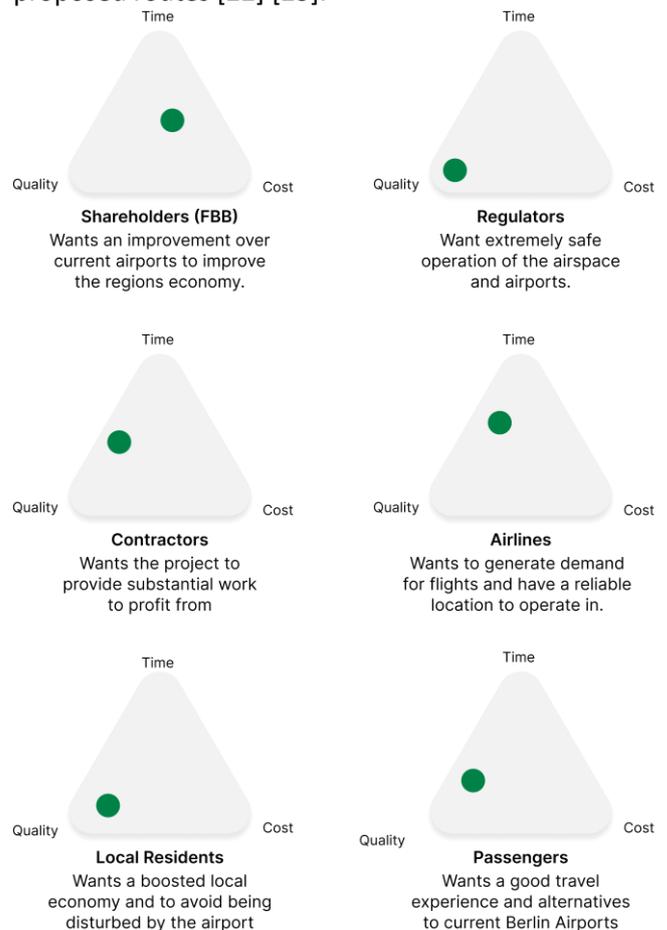


Figure 3 – Time-Quality-Cost Triangle of stakeholders



Figure 4 - Stakeholder Scope Grouping

2.3 Time Planning

From the point of inception in 1990 to its opening date of 31st October 2020, Berlin Brandenburg Airport had several milestones throughout the project journey. The project spent over 17 years in its planning stage before any construction began and went through 5 postponements before it finally opened 9 years late.

The airport will continue to evolve, with terminals 3 and 4 providing capacity for future expansion if required, so the overall project of a 5-terminal airport is still ongoing. However, this report focuses on the project phase up until the point of opening in 2020 [6].

Table 1 shows a comprehensive timeline detailing significant turning points in the project.

Table 1 – Timeline of the Brandenburg Airport Project [15, 24, 25, 26]

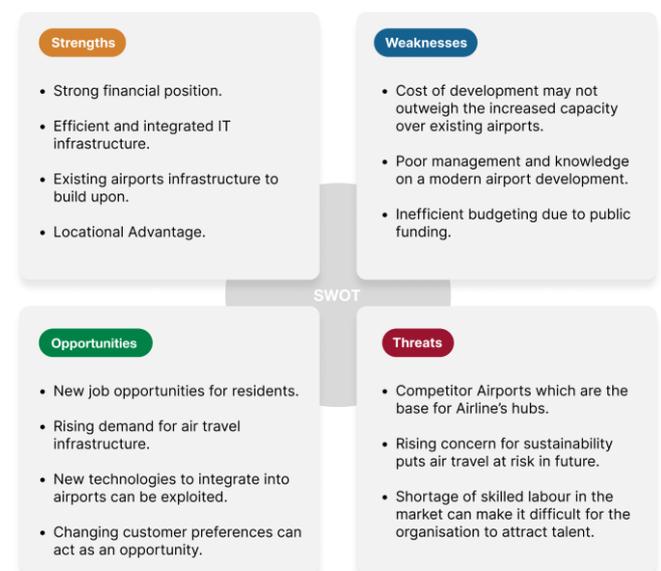
| | |
|--------------------------------------|---|
| 1990 | Proposed plan to build the new airport |
| 1996 | New Berlin Airport decided to be built at Schönefeld |
| 2003 | Berlin Brandenburg Airport rejects privatization, and the project is given to FFB. |
| 2004 | Final designs approved, and planning permission granted by Brandenburg Aviation Authority. |
| 5th September 2006 | Official construction begins, opening date set for 30 th October 2011 |
| 2008 | Construction works begin on the main terminal |
| February 2010 | Construction planning company (PG BBI) filed for bankruptcy |
| June 2010 | First Postponement - Delivery deadline postponed to 3 rd June 2012 |
| 2011 | Southern Runway construction completed |
| 2012 | Germany Federal Administrative Court ruled airport could open 3 rd June 2012 |
| 8th May 2012 | Second Postponement - FBB postponed as due to fire safety standards |
| 17th May 2012 | Opening date postponed to 17 th March 2013 |
| September 2012 | Third Postponement - Opening date moved to 27 th October 2013. Additional capital requirement of Euro 1.2 billion identified. |
| January 2013 | Fourth Postponement - 27 th October 2013 Opening date cancelled. No new date. |

| | |
|--------------------------------------|---|
| 12th December 2014 | Announcement, 2017 Q3-Q4 new opening date |
| July 2015 | Airport will not open in 2017 |
| Summer 2015 | Another construction company, Imtech, files for bankruptcy |
| 2015 | Announcement to build a new terminal |
| 21st January 2017 | Fifth Postponement - FBB postponed opening date to unspecified day |
| 15th December 2017 | BER opening set to October 2020 |
| 2018 | Interim Terminal construction terminated |
| October 2019 | Final opening date of 31 st October 2020 set |
| September 2020 | Construction of Terminal 2 completed |
| 31st October 2020 | Airport finally opened; first flights landed. |

2.4 Project Risk

Airports in Germany are known to take decades to complete from the initial design process to the official opening. Examples include Dusseldorf airport taking 5 years [27] and Munich airport taking 7 years [28]. Given these past examples, the states of Berlin and Brandenburg setting a completion date 5 years after construction started would indicate the entire project to be low risk. These risks are identified using a SWOT analysis and risk categories including scope, schedule, resources, technological and commercial. A qualitative risk analysis framework is also used.

Table 2 – SWOT Analysis



2.4.1 Scope

Despite having taken 15 years to design and plan construction, the BER CEO Rainer Schwarz requested the entire airport design be changed in 2018 [29]. He wanted to change the original rectangular shape to a U shape and add an additional second level [30], all to accommodate a shopping mall and new projections of higher airport traffic. The project scope of BER was not well defined due to management's desire to frequently adapt to updated demand projections.

2.4.2 Schedule

Construction of the main terminal building began in September 2006 and was expected to finish by 2011. An overall 9-year delay to project completion was the result of an inexperienced board of directors, technical faults, and the unethical hiring of an unqualified fire safety engineer. In total 6 delays for the official opening of the BER airport were announced with 1 announcement labelled as "unspecified". Even after the bankruptcy of two contracted major construction companies in 2010 and the installation of additional security screening lines at the north and south pavilions [8], plans to construct an interim terminal were in effect and later terminated before a new official opening date on 31st October 2020 was finalized just 11 months after the "unspecified" opening date. Scheduling risks were not well managed due to repeated and discarded official opening dates.

2.4.3 Resources

The German Federal Administrative Court (GFAC) ruled to allow original planning permissions with a budget of €2 billion by the Flughafen Berlin Brandenburg GmbH (FBB) airport operator. With a budget overrun that cost taxpayers €7 billion in total [5], more than 3 times over initial cost estimations. Bribes and scandals were commonplace during the construction saga [31]. In 2013, after the 3rd postponement for an official opening date, the FBB former technical director Jochen Grossman was accused of accepting \$680 000 in bribes. In 2015, an airport official was convicted by the Berlin court of accepting bribes from Imtech Deutschland, a contracted fire and smoke vent provider which filed for bankruptcy the same year. Furthermore, the European Court of Auditors realised weaknesses in the literature of the BER planning documents [32] in 2009 which had to be modified, leading to delays, and allowing FBB to directly award additional contracts without a bidding process, driving up costs. The construction is labelled an economic disaster for the Berlin economy.

2.4.4 Commercial

Updated demand estimates for airport traffic caused design changes to the entire airport to accommodate

higher traffic of passengers through the airport [30]. This would have been classified as good airport management if the changes and construction time had been kept to the official schedule but were not as evidenced by the 6 postponements and 9-year delay. FBB fundamentally failed to optimize their budget, expected time frame and expectations of its customers.

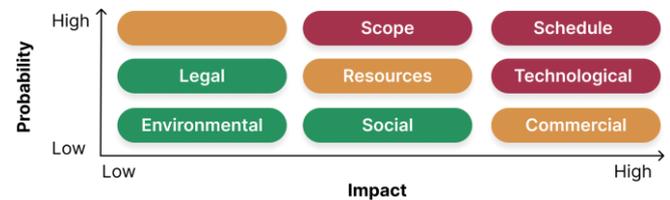


Figure 5 – Risk Analysis Framework

2.5 Project Organisation

The organisational and ownership structure of BER has not changed since its conception with joint ownership by the state of Berlin, the state of Brandenburg and the federal republic of Germany. The entire project relied on contracting other companies to provide the necessary manpower and safety systems for the airport to operate such as Imtech [33].

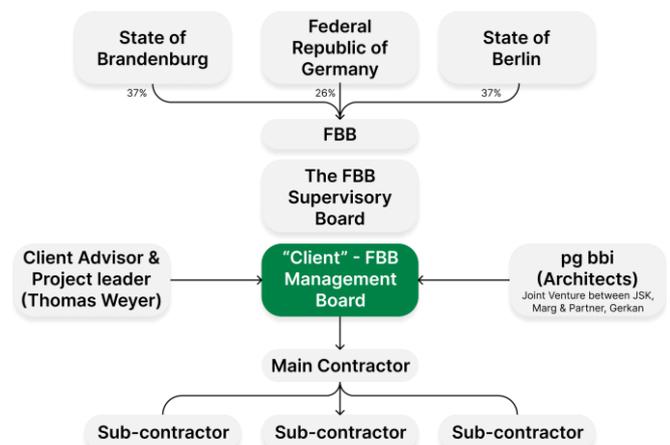


Figure 6 – Planned Project Organisation Structure [18]

Despite the planned structure in figure 6 [18], the FBB was unable to hire a main contractor as the tender bids received were deemed uneconomical. To reduce costs, they split the tender into around 35 lots with an equal number of sub-contractors bidding on each. This decision meant that the FBB not only acted as a client but also took on the role of a general contractor. The FBB's lack of construction expertise was exploited by sub-contractors, who recognised their influence over the client and the project's overall lack of transparency.

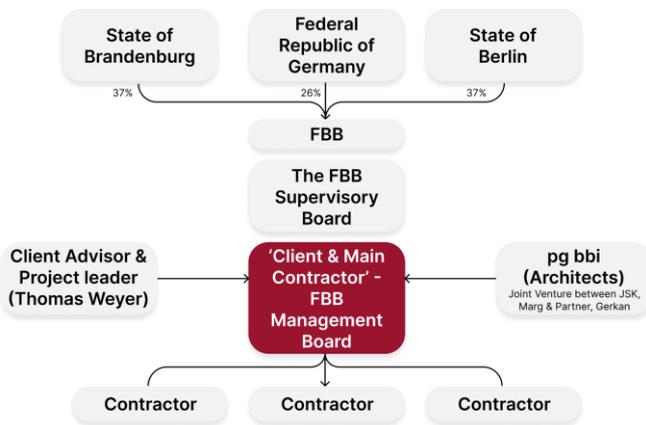


Figure 7 – Actual Project Organisation Structure [18]

The BER airport project followed the activity breakdown shown in figure 8. The interdependencies of each activity indicate that a functional breakdown is also possible. Although the fire alarm systems and bag-checking security systems are core aspects of the terminals, the southern runway and underground railway station also required their own independent security and fire safety systems as well.



Figure 8 – Partial Project Activity Breakdown [20]

3. Project Evaluation

3.1 Stakeholder Management

Since the beginning of the project, the roles and responsibilities of the teams were not fully established. Most of the advisory board had little had very few management skills and were not qualified to supervise this project [34].

From the beginning, not only was the management not set up properly, causing delays there were arguments over the ownership of the project. It was initially set out to be privatised, however, after a bidding war, to decide the main shareholder it was found that this auction was heavily biased toward the Hochtief consortium over IVG. This resulted in joint ownership over the project. With the delays incurred from this ownership agreement, the board agreed it would be

best to make this project public. Therefore, all time spent privatising was subsequently wasted [20].

Analysis shows that many stakeholders had not been fully considered throughout the project. Air Berlin, one of the biggest external stakeholders for the airport had decided to focus their attention on making this new airport its hub. This meant investing more money and time into the airport on their behalf. However, due to the severe delays, the airline lost millions and therefore sued to get compensation for damages [17].

Another example of failed awareness of the external stakeholders was the consideration of the citizens living in the nearby area. Since aeroplanes are very loud, local citizens were heavily disrupted by the sounds. Therefore, to mitigate this damage, the soundproofing installation had to be installed in 2,000 flats resulting in a cost of €600 million and a yearlong delay, which could have initially been avoided if the local community was involved in the design process from the start [35].

3.2 Risk Management

Throughout this project, there were many risks that occurred, which in turn delayed the opening date even further. Firstly, prior to construction Meinhardt von Gerkan was hired as the airport's architect [36]. This was a large risk due to his dislike of shopping, yet airports receive up to 50% of their revenue from the shops inside of them. Meinhardt decided to design an airport with little space for shops. This was realised too late, and so later on an extra floor had to be built to accommodate the extra retail space.

There was one major technical risk that occurred during the project that impacted both cost and time. In 2012 (when BER was planned to open), BER was found to have 120,000 defects, including some of the biggest risks to the project like fire safety system issues [37]. Around 170,000 Kilometers of cable installed around the airport was found to be dangerously wired. However, management did not want any further delays and so proposed to hire 800 fire spotters around the airport to account for the failed fire system [38]. This was not passed and so the airport underwent a full rewiring. This risk could have been avoided with consistent checks of the systems within BER throughout the construction process.

Finally, one large risk that occurred within the board of executives was with Hartmut Mehdorn [39]. As one of the chief executives of the Airport, he was involved in several bribery lawsuits surrounding the airport, thus leading to enquiries about the management of the airport and decisions made. Due to this, uncertainties arose about BER's future.

Overall poor risk management was one of the major factors that contributed to delays and cost overruns during this project. Risks were not thoroughly checked during the project or even considered, which led to them escalating out of control contributing to the overall failure of the airport.

3.3 Communication

One of the key factors contributing to the delays and cost overruns was poor communication within the project management team. The airport was designed to be one of the largest in Europe, with a capacity of 27 million passengers per year, and its construction involved multiple contractors, subcontractors, and government agencies [37]. However, the project management team failed to effectively communicate and coordinate with these various stakeholders. For example, one of the biggest delays and cost expenditures of the project was the problems with the fire system [40]. The main reason for these problems was that the main engineer of this system was not a qualified engineer, despite claiming to be on his business card. He was only qualified as an engineering draftsman. Poor communication was clearly shown in this instance, as he was never asked to provide proof of qualification and hence it was assumed he was fully qualified for the role.

From the beginning of the project, there was no general contractor. No one to supervise what was happening within the airport, and no clear manager overseeing it all. This led to confusion about who was responsible for what, and therefore the relevant information was not making it to the relevant stakeholders [29]. For example, there were many problems with the fire systems, but considering no one asked about it, it was not communicated. With this problem only being revealed last minute, it caused further delays and cost implications.

Overall, communication was a major flaw in the project. Impacting the airport in many ways. This clearly highlights the need for effective and clear communication and hierarchy within a project.

3.4 Cost

The airport was initially estimated to cost € 2 billion [5]. However, this ended up being more than 3 times the initial amount, at a final value of €7.

The excessive overspending on the airport was due to a multitude of reasons, mainly including poor project management. It was evident that there were

inadequate cost estimations and a lack of proper controls on spending. [41] For example, increased expenses for soundproofing residents' homes, and failure to check the wiring of the building.

The reconstruction of systems, such as the fire system and wiring system ended up adding an extra €500 million to the project [42]. These unplanned costs meant that €2.5 billion had to be borrowed from the EU (European Investment bank) to veer the airport away from bankruptcy. However, it was later found that some of these costs were falsified by the FBB. This raised doubts about the validity of any of the costs throughout the project, eventually putting the whole project under review.

3.5 Quality Control

The quality of the work carried out during the construction was not prioritised. In fact, speed was of higher priority than anything else [40, 36]. This can be seen from the poor installation of the cables and the faulty fire system. There was also a lack of inspection during the construction process, leading to inexperienced workers leading large projects within the airport. This lapse in quality control has poorly impacted Germany's reputation for creating builds of high quality.

The oversight in quality control led to severe delays and additional costs. This highlights the importance of effective quality control to ensure not only the safety and functionality of the end result but the economic viability too.

3.5 Time

Despite being originally scheduled to commence operations in 2011, the Berlin Brandenburg Airport suffered a series of repeated postponements and management shortcomings which delayed its opening until 2020 [43]. These overruns are a defining aspect of the project's failure, as defined by Holgeid and Thompson: "Project Failure: The project is either terminated or not completed on-time, or not within budget, or not providing the full value aimed for" [44].

Given that it is not uncommon for publicly funded megaprojects in infrastructure to fall short of time and budget goals, it should have heightened the caution of the decision-makers responsible for the management of the project.

It may be suggested that optimism bias was a reason for timetable overruns. In its study for the UK treasury, Mott MacDonald found high optimism in forecasting

costs, delivery times, and project benefits, likely caused by failed risk identification and management, often leading to time issues in large-scale infrastructure projects [45]. As shown above, the Berlin Brandenburg Airport project had poor risk management, which likely led to repeated optimistic time estimates.

While project managers were calling for a postponement and redesign of the airport in 2007, the architects' office, GMP, was determined to stick to the opening date "at any price". The failure to appoint a general contractor meant that most of the sub-contractors only agreed in 2009 which made it severely unrealistic to meet the original deadline of 2011 [20]. To advance with the construction work, an "acceleration bonus" was given to contractors without proper oversight of success metrics, slowing down meaningful progress [5]. Later in March 2013, the newly appointed head of the airport Hartman Mehdorn promised to ensure rapid completion of the airport with a sprint program, saying "We will be ready to name a date by the end of the year at the latest, and that will be it. That, I guarantee" [5]. These confident words were quickly overshadowed by unrealistic timeframes due to their cost, reflecting the suggestion that high optimism may have led to poor decision-making.

4. Lessons Learnt

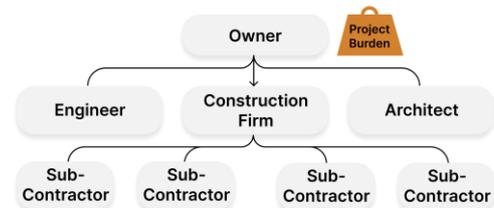
This section details 5 key lessons learnt from the BER project and suggests project management techniques and frameworks that could be implemented to aid further improvement in each domain discussed.

4.1 Hiring a General Contractor

For a project with this level of complexity, hiring a general contractor (GC) would have been beneficial. A GC would have been responsible for managing the technical and financial aspects of the projects while overseeing all subcontractors, managing the schedule, and enforcing quality control. Not having a GC meant the FBB, while not qualified to do so, solely took on all the technical and financial responsibilities and risks.

In hindsight, the FBB should have stuck to its original plan of delegating this responsibility to a GC while still maintaining a sufficiently detailed understanding of the project requirements to be able to efficiently communicate with contractors.

Traditional Method



Design-Build Method

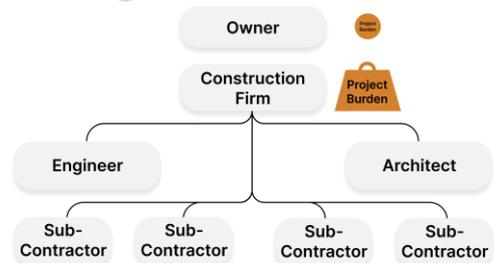


Figure 9 – Design-Build Methods delegates to free up the project owners

This decision fault could have been avoided if the FBB followed the Design Build framework [46]. This method aids project delivery by streamlining the process for the owner, the FBB, by uniting all design and construction phases under a given entity (a GC).

4.2 Acting as a "Smart Client"

Following on from the first key learning is the notion of the FBB becoming a smart client [47]. In the case of the BER project the public entity, the FBB, chose a contractual situation whereby their project manager (PM) and architects had limited power to ensure the project stayed on track. This authority was given to the private sector subcontractors lending the FBB to become completely reliant on them for expertise and project management rendering the FBB a 'dumb' client. The lack of involvement from the FBB was a mistake, as they wasted time trying to ensure the subcontractors were meeting their requirements rather than the other way around.

Any scenario, hiring a GC or not, should require the public entity who is responsible for the delivery of the project to be a "Smart Client" as seen successfully in the London 2012 Olympics project [48]. From this project's success, it can be suggested that if the FBB were a Smart Client they would have been able to set defined goals and establish key progress tracking metrics for the contractors. Furthermore, it could have enabled its own PM and architects to have effective power over the project timeline and design. Crucially, the FBB could have engaged in a more fruitful relationship with their contractors by consistently giving feedback and guidance across the project

lifetime to prevent implementing expensive last-minute changes to ensure the project was to their satisfaction.

4.3 Rigorous Quality Control

As previously touched upon quality control was a key point of failure in this project, resulting in a multitude of defects that needed to be addressed. Quality control needed to be implemented at the outset of the project management strategy for the design and construction of the airport.

One of the biggest problems with quality management, albeit stemming from poor communication, was the hiring of unqualified personnel into critical roles. This led to severe fire safety concerns in the airport which were costly and time-consuming to fix. The implementation of quality control measures such as frequent testing and inspection of personnel, materials and construction practices would have spotted these issues and prevented them from worsening. The project could have considered utilising the Quality Management Framework (QMF) [49] which would have guided the team to better establish quality standards. The QMF paired with the Plan-Do-Check-Act (PDCA) [50] cycle would have supported the team to continuously monitor and improve project quality.

4.4 Communication with Stakeholders

Ineffective communication was a fundamental part of the downfall of this project. There was little communication between significant stakeholders in this project resulting in their exclusion from imperative decision-making processes. The airport's sponsors and supervisory board members were often given filtered or doctored information, while the parliaments had almost no access to updated information. The lack of transparency and systematic external examination (assurance) from stakeholders allowed the project to overrun as nobody was properly being held accountable for their tasks.

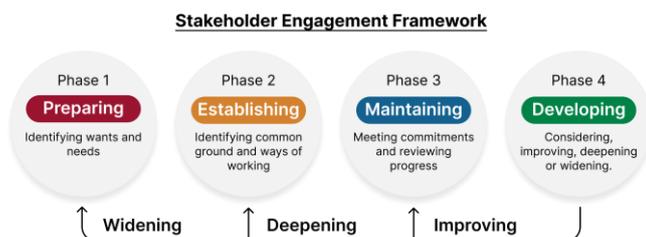


Figure 10 – Stakeholder engagement technique

The UK government stipulates that assurance should be undertaken with line managers, sponsors,

parliaments, and the public [51]. This could have been executed using the stakeholder engagement technique [52]. This method helps a management team to identify all their stakeholders, and measure their requirements in terms of time, cost, quality, and any additional needs. Then they can be placed on a stakeholder map where their interest and power in the project can be evaluated. This can be used to develop a stakeholder engagement plan outlining what manner they will be communicated with, either conventional or participatory, and the frequency of communication deemed satisfactory for the project timeline. This information can be displayed on a readable communication map and documented in the project charter to ensure that the communicative metrics for success are achieved.

4.5 Scope Definition & Effective Planning

Central to many of the problems incurred in the project were poor scope definition and time planning. Firstly, this project highlights the importance of preplanning the tendering process before contracts are awarded. Each of the 50 subcontractors was individually responsible for core aspects of the airport and the team did not allocate enough time to thoroughly plan each of their tasks. This resulted in parallel planning which refers to when parts of a project are planned and executed independently of one another without sufficient integration. The impact of one section was not considered on others causing coordination flaws, rework, and delays.

Secondly, the timeline that had been planned was overly ambitious for a project of this scale, suggesting the project had not been sufficiently scoped out. Being unrealistic from the offset allowed for scope creep, and major underestimation of the time allocated to the design and construction phases. Finally, without proper contingency plans in place for when unexpected setbacks inevitably occurred the project had no direction to follow. These problems could have been alleviated by using the SMART Scope Statement framework [53]. This technique helps project managers to define every element of the project scope while also listing assumptions and their acceptance criteria. This framework should be the primary reference for the team and its stakeholders to use while evaluating the success of the project. Furthermore, following the Critical path Method (CPM) allows for the identification of all the tasks that are required to be completed on time for the project to be completed on schedule [54]. This helps managers to focus their efforts on ensuring these tasks get done and avoid getting stuck on expanding the scope of the project.

5. Summary

From undertaking a detailed analysis of the Berlin Brandenburg Airport in the context of project management, as well as evaluating the key areas that caused the project to run significantly over budget, time and out of scope, there are valuable lessons to be learnt from this project. Despite detailing the most significant issues, the project involved problems in every single area of the Project Management Body of Knowledge (PMBOK), highlighting the lack of project management.

Table 3 – Project issues fell into every PMBOK area.

| PMBOK Knowledge Areas | The BER Project |
|---|---|
| Project Procurement Management | The management of multiple tenders, and granting them decision-making authority prior to detailed design, resulted in numerous change requests, highlighting inadequate monitoring of the various contractors involved. |
| Project Risk Management | Risk estimations for achieving the cost and time targets were low along with contracts that got changed from fixed price and time, to fixed rates without penalties. |
| Project Schedule Management | Project changes were not synced with the project schedule. The activity estimations proved to be false resulting in late delivery times. |
| Project Stakeholder Management | The stakeholders were missing valuable regarding the project. They were also not included in the steering committee. |
| Project Quality Management | An example of problems regarding project quality is the need to replace more than 600 parts of the internal walls not allowed under fire protection regulation. |
| Project Integration Management | Low stakeholder involvement resulted in insufficient information and changing project management plans. |
| Project Cost Management | Cost Estimation was not accurate. Budgeting and cost controlling were over the estimations. |
| Project Communication Management | Effective communication was critical, but the management team was unable to access valuable knowledge and information due to key stakeholders withholding it. |
| Project Scope Management | Despite the widening of the project scope, the planned delivery dates remained unaffected, resulting in time and cost overruns. |

It was also apparent that the project management failures were not isolated incidents, and had implications for subsequent stages of the project. For example, the lack of a specialist general contractor as a stakeholder had implications for quality control, and the parallel planning and construction of the airport. This spiral of issues can be visualised in figure 11.

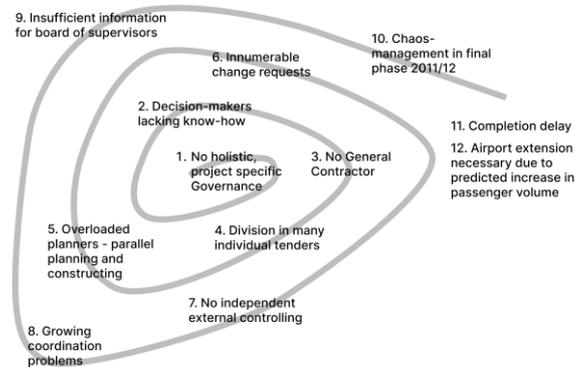


Figure 11 - Vicious Spiral of Project Management Issues

Despite these setbacks over the course of the project, the Brandenburg airport opened in October 2020 and is increasing in passenger volume each year, as the economy recovers from Covid-19. With the potential to expand to terminals 3 and 4 as shown in figure 1, the airport has the future capacity to deal with the worlds growing population and establish itself as an important airport for Europe. However, the airport will be remembered for its failures during planning and construction and will provide valuable insights for future project management assignments.

5. Appendix A – Reflection

5.1 Project Organisation

The writing of this report was organised using several project management tools. In our initial meeting, the team broke down the report into smaller tasks using a Work Breakdown Structure (WBS). A phase-based breakdown was chosen to align the members of the team with external deadlines, and handover dates between phases were decided in advance.



Figure 12: Phase-Based Work Breakdown Structure

The four phases in this WBS were given deadlines, and a Gantt chart was used to assign tasks to members. Harry, Josh, and Julian were responsible for phase 1 of the report writing, and Eve, Leo, and Madelaine were responsible for phase 2. Several dates were set as milestones to function as internal deadlines, including a handover date to update the phase 2 team on the

collaborative MS Word document to minimize downtime, and communications were conducted in a FB Messenger group.

5.2 Project Learnings

The Gantt chart intended to ensure we were not impeded by external deadlines and to block out ample time to complete our sections while reviewing each other's work. However, we found that the allocated time may have been too lenient, and the team suffered from a form of Parkinson's law, where the tasks were extended to fill the space unnecessarily. With tighter timeframes, the project may have been completed more efficiently in a shorter period.

A takeaway from this process was that planning with tighter timeframes and better-suited deadlines could make the execution of projects much more efficient. By shortening the total span of the project and allocating time in the end as slack for overruns, the project may have been completed far in advance, giving us complete freedom to complete our external deadlines.

Despite the potential risk of leaving only a few days remaining at the end of the project, the team were able to meet every milestone and deliver the report ahead of the deadline without significant issues. However, this highlights the importance of not over-allocating time for tasks, as it could have significant consequences, as per 'Murphy's law.'

During this module, each of us learned valuable new skills that we will take forward into our careers. Each member summarised their learnings. See Appendix B for the team's individual lessons learnt.

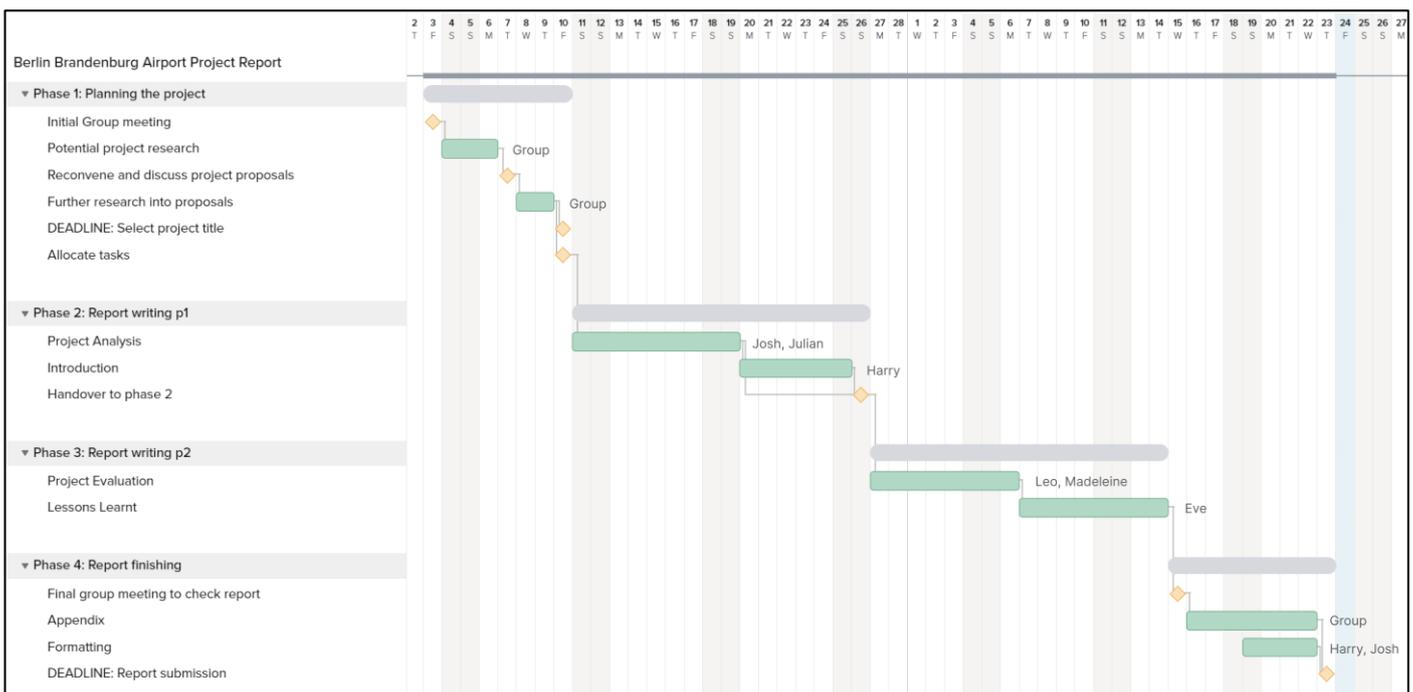


Figure 13: Project Gantt chart including resource allocation

5. Appendix B – Individual Lessons

Eve Williamson

I am now able to move forward with more confidence in managing a project, which will be especially beneficial in my new startup venture. From this module, I have learnt about the importance of identifying and understanding project stakeholders and how to effectively communicate with them. I have better developed my abilities to ensure a team is aligned on common goals and objectives and ensure that problems do not escalate. Whether this is through effective time management, scope definition, or risk assessment or I feel this module has aided me to move forward in achieving my future career goals.

Harry Schlote

After deciding to pursue a project management role after university, the frameworks and tools learnt from the module will be invaluable. Having used Gantt Charts previously in university projects helped to structure work, but learning about breaking down projects into smaller assignable and measurable work packages will greatly help to better structure future projects. Learning about Critical Path Analysis and Chain Buffer Management will also help me to better calculate how long projects should take to ensure that the correct amount of time is spent on tasks and projects overall.

Joshua Lowe

Throughout the project, I learned how important defining a project scope with stakeholders is to a project. Without the proper definition, there is the risk of scope creep resulting in the project not being able to efficiently meet its core objectives. This is a key lesson for me to use in the future to structure and plan out the project and clearly define the objectives I will want to address whilst coordinating with stakeholders to have a more transparent view.

Julian Syn

I didn't know much about how time allocation was an important factor when planning projects since I had only worked in teams where each department would decide on its own timeframe and submit it to management. With tools such as CPA and PERT, I will have another perspective on how time allocation by a central authority can affect project performance and company performance.

Leo Planck-Prideaux

Reading about the abominably poor management of this large-scale public infrastructure project sparked my curiosity and made me realise how important the tools we learned in class are. Now armed with a larger toolbox of time management tools, I am excited to be able to design better project timelines for my projects after university. Further, learning about CPAs and risk analysis has given me a new perspective on how to plan for a large project!

Madelaine Wood

Through this project, I learnt the importance of considering all stakeholders from the very beginning, as well as making sure communication is made not only at the start, but throughout the process of a project. I will be more aware of the critical considerations needed when choosing team members to make sure everyone is qualified for their roles.

When discussing the project at the end, we unanimously agreed that it was surprising that this project went so poorly in a country well known for its excellence in engineering standards. Persistent scope creep, lacklustre ability to check basic credentials, and poor construction management all occurring at the same time spelled out for a disaster of a project, however, fortunately for us it was a great learning opportunity.

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