**THESIS ON THE JEDDAH TOWER PROJECT**

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# Introduction

Jeddah Tower is a human-made structure in which the total height of the building ranges 1 KM i.e., (3280 ft) which is above the sea level. This building is shaped as a Y-structure skyscraper which are having apartments in it. This tower is supposed to be one of the tallest buildings in the world ahead of Burj Khalifa. Unfortunately, the construction did not progress which will be later discussed in this thesis. This building is located in the eastern coast of Saudi Arabia in Jeddah economic city. It has full wide spectrum view facing towards the Red Sea. Further, the initial plan has a wide range of floors which has a total of 167 floors, having 58 lifts and 2 double decker lifts which travel at a speed of 10 m/s. The floors in the building consist of luxury residential rooms, relaxation clubs, hotels, gym, spa, cafes, and sky lobbies. The building has a total floor area of 243,886 sq.m (thebuiltenvironmentreview, 2018).

The construction of Jeddah tower started way back in the year of 2013 but later it came to a halt in 2018 as only a third of the tower has been constructed and its due to the reasons mainly financial - Economical and Technological- manpower issues that are faced at the time of Covid pandemic. These reasons are taken according to PESTLE Analysis that is taken into study. The estimated completion date for the project of the Jeddah tower was after 2020 as this is not completed. The total estimated cost for the construction of Jeddah tower is calculated to be 4.6 billion dollars (webuildvalue, 2021).

Below is the picture which shows the third of the building completed. A general project management method is taken into consideration from the beginning of the phase of the project till the end.

Project scope:

**Stakeholders:**

The Jeddah Tower project's stakeholders collaborated extensively during the construction period to make sure the project was finished on schedule, on budget, and to the requisite standards of quality. The project was overseen and made sure to adhere to the goals and vision of the owner/developer, Jeddah Economic Company. In order to decide on the design, the materials, and the construction techniques, they collaborated with the other stakeholders.

The tower's overall design was created by the architecture firm Adrian Smith, Gordon Gill Architecture. They collaborated with the other parties involved to make sure the design satisfied the owner's needs and was structurally sound. The foundation, columns, and beams of the tower's structural system were all created by structural engineer Thornton Tomasetti. They collaborated closely with the contractor to guarantee that the design could be built and complied with all safety regulations.

To create that the tower was built to the necessary standards of worth and safety, they collaborated closely with the other stakeholders throughout the construction method. Throughout the construction period, Lee Herzog Consulting Ltd, the consultant, offered suggestions and leadership to the other stakeholders. They made sure everything was going according to plan and that any problems were dealt with right away. They made certain that the task was finished to the greatest levels and that its goals were met through effectively collaborating on it.

Planning: Project planning is the most important factor in any project. Taking Jeddah tower into consideration, below are the provided timescales for the project till completion which is on hold and will describe the main challenges faced during halt.

Construction phase: During this stage,

|  |  |
| --- | --- |
| **Timeline** | **Activities** |
| April 2013 | Construction started |
| December 2013 | Pilling works completed |
| February 2014 | Above ground construction started |
| October 2017 | Level 60 reached |
| January 2018 | On Hold |

In here, the project management team needs to know which task is more important and which should be given high priority and also need to meet the required timescale within specific period of the project. Moreover, the main resources like the manpower, equipment, facilities, and also funding in order to fulfill the requirements of the project. In the planning phase, the whole project activities can be picturized in a Gantt chart, so the project team will get a complete idea which activities that have to be managed.

Execution: During the execution stage of the project, there will be Kick-off meeting in which the stakeholders mainly the project management team will discuss about their requirements and deliverables required for the project and also the activities which have to be finished before the time period. Further to this, executing mega project like Jeddah tower, safety measures have to be taken care of beforehand of execution.

Project Monitoring and control: To track the progress and performance of the project in Jeddah tower, it can be measured by using certain KPI’s (Key performance indicators) to evaluate the activities progress. The main factors that include in project for monitoring the progress are safety, quality, manpower (total safe manhours) and performance (eSub, 2019). Activities can also be tracked by using software like MS projects and Primavera P6 in construction (Vivien, 2018).

Project closing: When it comes to the last phase of the project it is mainly project closure. Mainly by handing over the project to the client, releasing of manpower and punch clearing all the pending activities of the project and also running over through the cash flow structure and making of the final report of the project (eSub, 2019).

In the case of a project like the Jeddah tower since the project is on hold, there are main challenges that are faced which will be explained below in the next section.

# Problems

**Environmental challenges:**

* One of the biggest effective challenges faced in Jeddah tower is the wind problem where the building is completely exposed to wind especially on the high altitudes and the pressure of the air becomes more denser, as it travels at a faster rate of speed. This impacts the building so much and causes it to sway from side to side. On the other side, when the wind travels through the building, it curls among each other causing small tornadoes among themselves. These tornadoes are called wind vortex shedding. Further to this impact, it has become a big challenge for the project management and engineering team as this will cause a major problem for the building in terms of safety issues and design (artincontext, 2018).
* The impact of COVID-19 has affected so widely during the progress of the building of Jeddah tower. The construction of the tower was being put to hold in 2018, while there has been plans to restart the project further but due to the outbreak of Covid 19, the contractors and sub- contractors were mainly affected in the construction sector. As a result, there have been a lot of absences in the workforce which led to staff shortages. This has also affected the supply chain, where the material which reached the site caused a massive delay and some of the major items had to be brought from overseas are stopped due to cancelled transportation (construction line, 2022).

**Technological challenges:**

* The Jeddah tower vertical transport system commonly known as elevators plays a major role in coming to technological challenge. The tower has a total of 60 elevators for transporting people from the ground to top floors. This high-speed elevator travels at a distance of 36 km/hr. When the elevator reaches the top floor there is quick change in air pressure that is experienced on topmost floors which results in sickness to the people (artincontext, 2022).

**Economic challenges:**

* There has also been influence of economic crisis in Saudi Arabia in which the crash of demand in the oil prices. It affected mainly the construction sector. As a result, there have been disputes in labor forces mainly the foreign workers who are basically origin from Asia especially from Pakistan, India, Bangladesh, Nepal, and Sri Lanka (Ramy abdu, 2021). This has completely affected the progress in building Jeddah tower where the project came to a halt as there is less workforce and not able to continue the work. The work wages have also increased. (artincontext, 2022).

# Solutions

**Environmental solution:**

The Jeddah Rising frequently encountered air quality issues, excessive electricity consumption, and a lack of water. The project might make use of a green roof, green building methods, green building materials, renewable energy sources, green building concepts, and green building materials to deal with these problems (Wilson and Black 2022). By executing these arrangements, which likewise decline energy utilization, lower fossil fuel by-products, improve air quality, and preserve water, the structure's natural effect can be decreased. By employing environmentally friendly techniques, the Burj Tower project can contribute to Jeddah's overall sustainable growth and serve as an example of a green building.

**Technological solutions:**

A variety of technological obstacles had to be overcome for the Riyadh Tower project, such as the requirement for trying to cut design and construction methods to build such a high tower, the creation of an advanced lift to transport people and goods, and the adjustment of having to use cutting-edge management services for buildings to track and regulate the processes of this same building (Szolomicki and Golasz-Szolomicka 2019). Modern technology like solar cells, wind generators, and low-impact concrete must also be incorporated into clean energy sources and green construction materials. A substantial amount of study and development, investing in trying to cut technology, and cooperation with professionals in other industries, such as architecture, construction, and sustainable design, will be needed to overcome these technological limitations.

**Economic solutions:**

The construction of the Jeddah Tower presented other financial difficulties, such as the enormous cost of creating such a tall structure, the requirement for specialised tools and expert workers, and the long-term expenses of running and maintaining a structure of this magnitude. Including sustainable elements and technology could necessitate a larger initial expenditure than using conventional building techniques, which could affect the project budget as a whole (Dmitriev *et al.* 2019). In order to overcome these obstacles, the project can employ cost-cutting strategies, investigate financing alternatives like public-private partnerships, and take into account the long-term financial advantages of sustainable design, such as lower energy costs and increased building efficiency.

# Lessons learned

The Jeddah Tower project had numerous difficulties because of economic, technological, and environmental issues. These difficulties provide numerous crucial lessons for upcoming high-rise construction initiatives.

**Comprehensive Planning:** The Jeddah Tower project exemplifies the value of thorough planning for sizable construction projects. Careful preparation and communication amongst various stakeholders are necessary to meet the diverse issues that occur from the initial concept to the building and operating phases (Doheim *et al.* 2019). An all-encompassing strategy guarantees that the project's components—from economic viability to environmental sustainability—are taken into account and maximised.

**Sustainable Design:** Sustainable design is becoming more significant in high-rise building projects. The Jeddah Tower project places a strong emphasis on the value of using sustainable materials and technologies in building design to reduce negative environmental effects and boost energy efficiency. Reduced energy costs and improved building performance could be two long-term financial benefits of sustainable design.

**Technological Advancements**: The Jeddah Tower's height necessitated the use of sophisticated engineering and construction methods. The project serves as an example of the value of making technology investments in order to overcome high-rise development issues (Almasri and Narayan 2021). In order to address issues with structural stability, environmental sustainability, and energy efficiency, upcoming plans may need to rely on novel materials, building methods, and building management systems.

**Collaboration and Coordination:** Working together and coordinating efforts among numerous parties, including developers, designers, engineers, contractors, and government officials, were crucial to the Jeddah Tower project's success. Addressing the numerous issues associated with high-rise development and ensuring that the project achieves its aims and objectives require effective communication and teamwork.

**Public-Private Partnerships:** Public-private partnerships that combine governmental resources and private sector experience can be advantageous for high-rise development projects like the Jeddah Tower. Such collaborations can give the money, knowledge, and other resources required to overcome finance, building, and operation obstacles.

**Skilled Labour:** Skilled labour is needed to construct a building to satisfy like the Jeddah Tower, comprising architects, architects, construction workers, and operators of specialised equipment (Peronto *et al.* 2019). The project serves as a reminder of the value of spending money on the education and training of skilled labour so that efforts to build high-rise buildings in the future may rely on a knowledgeable and talented crew.

**Risk Management:** High-rise development projects carry a large amount of risk during the building, running, and maintenance phases. The Jeddah Tower project serves as an example of the value of employing efficient risk management techniques to reduce these dangers and guarantee the security of residents, guests, and the neighbourhood.

**Economic Viability:** The long-term survival of high-rise construction initiatives like the Jeddah Tower depends on their economic viability. For a project to be economically viable, cost control and income generation must all be carefully considered. Future high-rise construction projects could profit from comprehensive economic research to make sure the project is feasible financially.

**Public Acceptance:** The public may object to and scrutinise high-rise building schemes. Concerns about the height, location, and environmental effects of the Jeddah Tower project were raised (Weismantle 2019). To ensure that the project is approved by the local community, future high-rise development projects can benefit from employing efficient public involvement and communication tactics.

**Sustainable Urban Planning:** The Jeddah Tower project emphasises the significance of environmentally conscious urban design to address issues brought on by high-density urbanisation. Urban planning techniques can promote sustainable transportation options, green spaces, and steps to conserve water, lower energy use, and enhance air quality.

For upcoming high-rise construction projects, the Jeddah Tower project provides useful lessons. Successful high-rise development projects must include all of the following: thorough planning, environmentally friendly design, modern technology, cooperation and coordination, public-private partnering, skilled labour, risk assessment, economic viability, widespread understanding, and sustainable urban planning (Moon 2020). By taking into account these elements, upcoming high-rise construction projects can overcome obstacles and provide sustainable, economically feasible, and acceptable structures that satisfy modern needs.

# PESTLE analysis

**Political:** Although Saudi Arabia's political climate is generally stable, geopolitical dangers can nevertheless affect the nation. Government rules and legislation like zoning rules and environmental legislation may also have an impact on the project.

**Economic:** The venture's money might be impacted by the fluctuating idea of oil costs because of Saudi Arabia's reliance on petrol sends out. Changes in the global economy, such as shifting trends in international trade and currency exchange rates, may also have an effect on the project.

**Social:** The Jeddah Tower project could encounter social issues, such as criticism from local groups worried about the project's effects on their way of life (Alamil 2022). Differences in culture between Saudi Arabia, as well as other nations, may also have an effect on the project.

**Technological:** Regarding technology, the Jeddah Tower project mainly relies on cutting-edge engineering and construction methods. The project might be impacted by the industry's rapid technological advancements, such as the introduction of new building materials or methods.

**Legal:** Zoning rules, building regulations, and environmental legislation, among others, may apply to the Jeddah Tower project. Legal issues with subcontractors or other stakeholders could potentially have an impact on the project.

**Environmental:** The Jeddah Rising steadily may have a large negative impact on the environment, such as utilizing resources, energy use, waste creation, and emissions (Junqueira *et al.* 2020). Climate change and natural calamities like earthquakes or floods may potentially have an impact on the project.

# VUCA analysis

**Volatility**: There are various risks to the Jeddah Tower project. The erratic oil prices, which may have an effect on the national economy and project funding, are one of the key obstacles. The success and timeline of the project could potentially be significantly impacted by changes in government legislation or policies.

**Uncertainty**: The Jeddah Tower's projected completion date is very speculative because it has previously been postponed a number of times (Green *et al.* 2019). Together with old uncertainty, the COVID-19 epidemic has created new ones like delays in supply chains and labour availability.

**Complexity**: Because of the involvement of numerous parties, including the government, financiers, contractors, and architects, the Jeddah Tower project is extremely complicated. Given the size of the project, maintaining these connections and guaranteeing alignment can be difficult.

**Ambiguity**: About the Jeddah Tower's potential effects on Jeddah and the surrounding area, there is uncertainty (Komen 2021). There are worries regarding the tower's potential environmental effects and increased possibility to the neighbourhood, despite the fact that it has the ability to become a major attraction and promote economic growth.

The Jeddah Tower project is a massively complex and ambitious undertaking that will encounter many difficulties and unknowns. The success of the project depends on effective stakeholder engagement and project management.

# Relationship with existing literature

According to Szolomicki and Golasz-Szolomicka (2019), a new skyscraper typology was used by architects to communicate their ideas about the future of the city a few years ago. Le Corbusier was one among them, proposing in 1923 a collection of 60-story office buildings. His later design for the Radiant City furthered the idea by defining zones for working, living, and relaxing. For many years, high-rise public housing developments in the United States and Europe have been built on Le Corbusier's plans for altering city centres. Another visionary of tall buildings was Frank Lloyd Wright, who designed the Illinois Tower, which would have stood a mile tall (Novak 2020). Although it was practically unfeasible at the time, Wright's concept set a benchmark in the ongoing competition to build buildings that were as tall as possible. Future predictions have evolved in the twenty-first century.

Wright's design is evident in the Mile-Height King Tower that was constructed close to Jeddah. The Nakheel Tower, which has a proposed height of nearly a mile, is designed to resemble Dubai's Burj Khalifa, the world's tallest structure in terms of height. It is planned for Kuwait to reach 1001 metres, representing the Arabian Tales collection of tales. The development of skyscrapers has turned into a trend that characterises cities in the twenty-first century. The fact that towers are no longer uniquely American phenomena is perhaps most remarkable. Presently, 72 nations have registered high-rise structures. Every city strives to construct a skyscraper as a symbol of power and wealth (Dongo *et al.* 2019). It contributes significantly to the technological advancement of modern architecture while also becoming a significant landmark in the city. Engineers are working harder than ever to create a structure that is extremely safe following a horrific terrorist attack on the World Trade Center's twin Towers in New York. As seen by the world's safest structure, technological advancement has certainly been a goal.

According to Rong *et al.* 2020, The clients' criteria heavily depend on their capacity to commit the necessary time and funds to complete the project. In many papers there are listed these two factors as CSFs for success of the project because they are two crucial components of the "iron triangle." Due to their stronger financial capacity than the private sector, the public sector agencies and council-cooperating institutes in Hong Kong serve as clients for ongoing large-scale MiC projects. The Local Fire Agency, Hong Kong University, as well as the Hong Kong Commission of Social Care are some of the organisations presently carrying out MiC programmes. A financial secretary established the HK$1 billion Building Innovation and Technology Fund (CITF) to promote innovation in the building industry, with 70% of the funds going to MiC initiatives. According to Construction Industry Council, MiC technology reduces project building time by 30% on average because several modules can be built concurrently in the plant. In conclusion, it is clear that the entire project management triangle has been impacted by changes in the budget and timing restrictions of the Jeddah Tower project.

# Conclusion

It is clearly shown that the project the importance of thorough planning and preparation before starting any significant building project. It is evident that with better programmed management from the beginning, a lot of project-related concerns would have been avoided. It is clear that the program's complexity and the area's unpredictability both played a role in it was eventually not successful. Repeatedly struggling, the project demonstrated that even the most difficult efforts may be undertaken and served as a life lesson for projects that will succeed in the future. The project could be interpreted as a cautionary tale regarding the requirement of proper oversight and preparation when it came to significant construction project.

# Reference list

**Journals**

Alamil, H.M., 2022. Knowledge sharing within the Kingdom of Saudi Arabia large construction organisations.

Almasri, R.A. and Narayan, S., 2021. A recent review of energy efficiency and renewable energy in the Gulf Cooperation Council (GCC) region. *International Journal of Green Energy*, *18*(14), pp.1441-1468.

Alsubhi, Y.H., Fageha, M. and Refaat, A., 2020. JEDDAH TADAWUL: JEDDAH STOCK MARKET. *Journal of Critical Reviews*, *7*(8).

Dmitriev, A.N., Vladimirova, I.L., Kallaur, G.Y. and Tsygankova, A.A., 2019. Approaches to Classifying Building Innovations while Implementing Information Modeling and Project Management. *Journal of Engineering Science & Technology Review*, *12*(2).

Doheim, R.M., Farag, A.A. and Badawi, S., 2019. Smart city vision and practices across the Kingdom of Saudi Arabia—a review. *Smart cities: Issues and challenges*, pp.309-332.

Dongo, J., Foltete, L., Mahmoudi, C. and Mourlin, F., 2019, December. Distributed edge solution for iot based building management system with ndn. In *2019 Global Information Infrastructure and Networking Symposium (GIIS)* (pp. 1-5). IEEE.

Green, S., Page, A.F., De'ath, P., Pei, E. and Lam, B., 2019. VUCA challenges on the design-engineering student spectrum. In *DS 95: Proceedings of the 21st International Conference on Engineering and Product Design Education (E&PDE 2019), University of Strathclyde, Glasgow. 12th-13th September 2019*.

Hassan, T., El-Ezaby, Y. and Malek, C., 2022. Structural Design of Iconic Tower, Egypt: Culmination of a Concrete Optimization Process. *CTBUH Journal*, (2).

Junqueira, H., Robaina, M., Garrido, S., Godina, R. and Matias, J.C., 2020. Viability of creating an offshore wind energy cluster: A case study. *Applied Sciences*, *11*(1), p.308.

Komen, O., 2021. *Influence of ambidexterity approaches on project success within the aviation industry in Kenya. A Case study of Wajir international Airport Rehabilatation projects* (Doctoral dissertation).

Moon, K.S., 2020. Developments of structural systems toward mile-high towers. *International Journal of High-Rise Buildings*, *7*(3), pp.197-214.

Novak, M., 2020. Book Review:“The Skyscraper Curse: And How Austrian Economists Predicted Every Major Economic Crisis of the Last Century”.

Peronto, J., Sinn, R. and Huizinga, M., 2019. Vertical shortening considerations in the 1 km tall Jeddah Tower. *International Journal of High-Rise Buildings*, *6*(1), pp.21-31.

Rong, X., Zhang, S., Bakhtawar, B., Hussein, M., Abdelmageed, S., Tariq, S. and Zayed, T., 2020. Performance assessment for modular integrated construction projects in Hong Kong. *International Journal of Architecture, Engineering, and Construction*, *9*(3), p.12020017.

Szolomicki, J. and Golasz-Szolomicka, H., 2019. Technological advances and trends in modern high-rise buildings. *Buildings*, *9*(9), p.193.

Szolomicki, J. and Golasz-Szolomicka, H., 2019. Technological advances and trends in modern high-rise buildings. *Buildings*, *9*(9), p.193.

Weismantle, P.A., 2019. Challenges in the Architectural Technical design of the New Generation of Supertall Buildings. *International Journal of High-Rise Buildings*, *7*(1), pp.85-93.

Wilson, L.A. and Black, D.A., 2022. The Intersection between Heatwaves, High-Rise Living and the Aged: A Narrative Review of the Literature. *Atmosphere*, *13*(9), p.1461.

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