

Project time
management of burj
khalifa economics
essay



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Burj Khalifa, a single place where tourism, hospitality, professionalism and leisure come together. Home to more than 1000 residences, Burj Khalifa accommodates a hotel, an observation deck, a restaurant, fitness and recreation club and also 37 floors of corporate offices. It brings in a concept of a vertical city with all the luxurious amenities made available on the top of the world. For the tourists and visitors coming to see this marvel, it is a long and a memorable journey of a lifetime ([www. burjkhalifa. ae](http://www.burjkhalifa.ae)). Burj in Arabic means ' Tower' and Khalifa stands for the name of the President of the UAE and the ruler of Abu Dhabi, his highness Sheikh Khalifa bin Zayed al- Nahyan. The initial name given to this tower was Burj Dubai but was changed to Burj Khalifa in the honour of the President for bailing out \$10 billion during Dubai's financial crisis. The completion of this tower has broken numerous world records. " At over 828 meters (2716. 5 feet) and more than 160 stories, Burj Khalifa holds the following records:

Tallest Building in the world

Tallest free standing structure in the world

Highest number of stories in the world

Highest occupied floor in the world

Highest outdoor observation deck in the world

Elevator with the longest travel distance in the world

Tallest service elevator in the world" ([www. burjkhalifa. ae](http://www.burjkhalifa.ae))

Fig 4. 2 and 4. 3 showing Burj Khalifa from different angles and shades of natural day light.

Emaar Properties have developed this project of Burj Khalifa. Skidmore, Owings and Merrill (SOM) have designed this beautiful structure and Samsung Engineering and Construction along with BeSix and Arabtec gave out the final product by constructing this tower. Turner Construction of the United States of America was responsible for the project management of this whole undertaking. This project estimated a cost of \$1. 5 billion for completion. “ At the staggering height of 2717 feet (easily more than two Empire State Buildings), this shimmering, spiralling mixed- use tower inevitably raises the question: When is big too big?” (Kamin, 2010 p. 78). The design of this building has been adapted from the Islamic architecture and has been inspired from a regional desert flower, the Hymenocallis. Adrian Smith was the sculptor for this design heading this project on behalf of SOM.

“ Constructing the Burj Khalifa required more than 22 million man hours from about 12, 000 professionals and skilled workers, and more than 60 consultants and contracting companies from around the world” (Skidmore, Owings & Merrill, 2011 p. 23). In a true sense this project was a global venture to showcase the feat of ultimate engineering and the technological advancement which the human beings have achieved through dedication and hard work all these years. “ Burj Khalifa was truly an international collaboration between more than 30 on- site- contracting companies from nations around the world. At the peak of construction, over 12, 000 workers and contractors were on site every day, representing more than 100 nationalities” (www. burjkhalifa. ae).

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Project time Management of Burj Khalifa:

There is no doubt that the time management of this project might have been one of the most challenging tasks that the team must have faced during its construction. The size and scope of this project was on such a large scale that some problems were inevitable, irrespective of any measures taken.

First we shall have a look at the construction timeline which will be analysed further. Also we will discuss the problems that the project management team had to go through and how well they were able to deal with it controlling the schedule of this project with minimum delays.

Fig 4. 3 Burj Khalifa Construction Timeline:

January 2004

Excavation started

February 2004

Piling started

March 2005

Superstructure started

June 2006

Level 50 reached

January 2007

Level 100 reached

March 2007

Level 110 reached

April 2007

Level 120 reached

May 2007

Level 130 reached

July 2007

Level 141 reached – world's tallest building

September 2007

Level 150 reached – world's tallest free standing structure

April 2008

Level 160 reached – world's tallest man-made structure

January 2009

Completion of Spire – Burj Khalifa tops out

September 2009

Exterior cladding completed

January 2010

Official launch ceremony

Source: www.burjkhalifa.ae

The total time taken for the construction of this building was 2, 192 days with the average height built per day was 37 centimetres or 1 foot and 2. 88 inches (www.theatlanticcities.com). If we carefully interpret the construction timeline as shown in figure 4. 3, we can understand that the work was speeding up when the project started. There was a steady growth during 2005-06 till level 50 was reached. Since then it took a long time to construct another 50 levels as the building was rising higher and the crew might be dealing with challenges arising due to it. From January 07 to July 07 the construction again picked up some speed as they were nearly building 10 floors every month. This was remarkable as the construction was reaching the heights where any construction worker might not have gotten. The construction was again slowed down in September 07 when level 150 was reached. After that it took 7 months to complete the top most floor of the building. The average height built per day might look small but considering the construction at 838 meters above ground is an achievement. Let us now move on to the actual problems faced by the project management while erecting the world's highest structure.

Issues affecting the Project Time Management of Burj Khalifa:

Listed below are some of the complications that had an adverse effect on the Project Time Management of Burj Khalifa. Emaar properties had plans to

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throw open this building in December 2008. Chairman of the Emaar Group Mohammed Alabbar announced the delay of about nine months scheduling the opening ceremony in August or September 2009 (www. arabianbusiness.com, 2008). However the opening was further delayed and this mega structure was finally released on 4th of January 2010. The project took 5 years and 4 months for completion. There were several problems during the course of construction of this building which lead to a delay of more than a year in delivering the project. Some of them were –

Pumping the concrete:

According to the officials pumping the concrete to the record height of 828 meters was the toughest part of constructing this tower. Two of the world's largest pumps manufactured by Putzmeister, were used to supply concrete for the construction of this building. These pumps unified with 150 mm pipeline could supply a massive 350 bars of concrete pressure. “ Above level 127 of the tower, a modified mix of concrete was used to account for changing pressure requirements due to height” (Skidmore, Owings & Merrill, 2011). In addition to that the climatic condition of Dubai was also a factor that delayed the construction process. “ Work at Burj Dubai is carried out in three shifts. Due to high day time temperatures up to 50° Celsius – the concrete works are usually carried out during the slightly cooler night time hours”(www. pmw. co. in, 2007). “ The effects of Dubai's fluctuating seasonal temperatures made it a challenge to properly pump, pour and set concrete” (Skidmore, Owings & Merrill, 2011). This could cause considerable delays as no concrete work was carried out during the day time.

Fig. 4. 4 showing the massive pipelines of the concrete pump and Fig 4. 5 showing the concrete pouring process.

Fig 4. 4 Fig 4. 5 Source: www. pmw. co. in

Labour Strikes:

Workers constructing the Burj Khalifa went twice on strike during the whole span of its construction. “ In March 2006, 2500 workers rioted at the Burj Khalifa site, demanding a raise in their pay” (www. migrant-rights. org, 2010). The labourers complained of being paid as low as \$4 per day and were asked to work 12 hours a day and for 6 days a week. Riots broke out and the workers vandalized various offices, cars, construction several machineries and equipment. “ Construction of what is expected to be the world’s tallest building was halted after 2500 workers in Dubai rioted over pay and conditions, causing damage estimated to £ 500, 000” (www. guardian. co. uk, 2006). The protest was also sympathised by the workers at the construction site of Dubai’s New International Airport laying aside their tools. The second protest was held in November of 2007. This protest was for their demands of pay rise as well as to provide better living conditions for the workers. “ The latrines are so filthy we cannot use them, we are so disgusted. The roads are full of garbage and waterlogged. Living and moving around is a great problem, an occupant reported” (www. migrant-rights. org, 2010). At both the instances the government threatened the workers to return back to work or face the consequences of mass deportations. This lead to unrest and the labourers were not satisfied which directly or indirectly have affected the construction. Yet the sources claimed that this

protest had no effect on the construction of Burj Khalifa. This can be considered as one of the biggest issue which might have contributed to the delays in the construction.

Fig 4. 6 showing the riots in 2006 and Fig 4. 7 where labourers are on strike in 2007

Source: www.bbc.co.uk

Dubai Economic Crisis:

In the year 2009, Dubai saw a downturn in its ever booming economy. People lost massive amounts of money as they saw the economy and the glittering real estate market go down. No doubt it was a tough situation for everyone. But it was even tougher for the building projects going on at that time. One of them was the all famous and glamorous dream project of Burj Khalifa. “ Half of the UAE’s construction projects, totalling \$582bn (£400bn), either have been put on hold or cancelled, leaving a trail of half-built towers on the outskirts of the city stretching into the desert”(www. guardian. co. uk, 2009). Not just in the case of investors and developers, the credit crunch had affected the construction worker’s lives too. As the projects were postponed or delayed, the workers were sacked leaving them no choice but to return back to their countries. Many of these workers were from South Asia belonging to countries like India, Pakistan, Bangladesh, Sri Lanka, etc. Burj Khalifa was one of the most expensive projects in the history of the UAE. Undoubtedly it had a lot to do with this financial crisis. “ The world’s tallest building, the Burj Dubai, officially opens its doors, leaving a colossal

reminder of the hubris that brought the emirate crashing in November” (www. guardian. co. uk, 2010).

Analysis:

The project of constructing Burj Khalifa was awarded to a team of experienced construction companies. The principal developer of this project Emaar Properties is a very popular Joint Stock Company developing projects all across the world in countries like United Arab Emirates, United Kingdom, India, Pakistan, Egypt, Lebanon, China, Canada, etc. and also some joint ventures in North America, Europe, Pan-Asia, North Africa and the Middle East (www. emaar. com). Giving shape to many projects in UAE, Emaar has a major contribution in Dubai’s Infrastructure development. It has developed much of downtown Dubai. Construction of the world biggest mall (Dubai Mall) and the world’s tallest tower (Burj Khalifa) is associated with this company. The company is led by its president Mohamed Ali Alabbar who was also in-charge of the decision making process of the Burj Khalifa. The company follows a decentralised structure of its organisation resulting to which the decisions were made customer oriented and quicker. The authority was delegated to the managers of each department which made it easier to save time. This project was directly under the supervision of the ruler of Dubai, his highness Sheikh Zayed Bin Rashid Al Makhtoum and had a lot of expectations of the people across the world.

Turner Constructions was responsible for the project management of the Burj Khalifa. This company is also a renowned name in the industry based in the United States of America. This organisation was constantly monitoring the

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progress of this project to ensure practice of good standards of project management to deliver efficient and satisfactory project outcome. Skidmore, Owing and Merrill were designing and Samsung Engineering and Construction and BeSix were constructing the project. Arabtec was involved in supplying man power to this project. The assignment was in the hands of well-known experienced professionals as they strived to achieve a dream to build the highest building in the world.

In spite of having a team of best people at work, there were some problems which were hard to prevent. Some of the issues related to the delay in the construction of this project are discussed above. Unfortunately it was found that all these problems were unavoidable. The time consumption of pumping the concrete high above the ground was very much anticipated and accounted for. But in the end it took a bit more time than it was expected to finish. The fluctuating temperatures in Dubai made it much more difficult for the workers to finish the task. The problems of Labour Strikes and the Economy prices came as a surprise to the initial planning of this project. But indeed the matter was way much serious than what was just reported. There have been speculations of workers dying during the construction of this building but the whole issue was suppressed and there have been no confirmed reports for the same. In a country like UAE, which is a kingdom ruled by the kings, there is very much little of what is known as democracy. Human Rights Watch reported numerous exploitations that construction workers suffer in the UAE, including unpaid or very low wages, many years of monetary obligations to the recruitment agencies for fees, seizing of employee's passport and dangerous working conditions that result in

apparently high mortality rates and injuries (www. migrant-rights. org, 2010). As a result of these conditions, strikes and protests were obvious. Formation of Labour unions is also prohibited in UAE but the labour ministry promised to set a minimum wage rate on the basis of which the strikes were withdrawn and work resumed.

Fig 4. 8 Dangerous Work being done at the Burj Khalifa

Source: www. gulfnews. com

The construction was getting back to normal and shortly after couple of years of this incident, Dubai experienced major financial crisis. Once again the smooth going construction was affected and delayed the project in return. The consolidated efforts of the companies involved tried their level best to continue the work and not let the schedule be affected but it was not possible until the President of UAE and the ruler of Abu Dhabi helped them bail out the indebt city of Dubai.

The whole process of constructing this tower was complex and painstaking. But Emaar properties and all other companies did a very good job in the end to complete this unique project in mere less than five and a half years' time and setting many world records. Undoubtedly it was a great effort from each and every individual involved which made it possible to fulfil this dream and deliver a marvel of its kind.

Fig 4. 9 a picture of some of the team members involved in the construction of this project put up in the building as an appreciation for their contribution.

Source: Self

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4. 2 Delhi Metro:

Delhi, a capital city of a country ranked second in the world's total population. Along with its population, the country is also going through a lot of economic, social, political and technological developments. Various plans and projects are being chalked out for the future to meet the needs of the ever growing population of this country and compete with other nations of the world to provide exquisite facilities. Work is in progress in few metropolitan cities which have been undergoing through a pressure of urbanisation. Delhi is one of them. According to the census of 2011, Delhi has a registered population of 16.7 million people and a growth rate of 20.96% as compared to the previous decade (www.census2011.co.in). With a remarkable growth in population and with limited space to accommodate, it is necessary to provide an equally capable infrastructure system which can ease the problems of its citizens. These infrastructure developments include convenient transportation facilities.

Fig4. 10 displaying phase I and II of Delhi Metro Project

“ National Capital Territory of Delhi covers an area of 1486 square kilometres and is a Union Territory with all powers of State Government” (www.delhimetrorail.com). The city limits are extending to fit in the size of population. It necessitates a robust transit system to transfer people from one place to another. The need to travel is a consequent need i. e. people do not travel just for the sake of it but do so only when the necessity to transfer exists. The necessity to move is dictated by people's requirements like work, study, leisure, medical, etc. In the background of inadequate urban capacity, global warming, increasing salaries and resulting motorization, it is <https://assignbuster.com/project-time-management-of-burj-khalifa-economics-essay/>

commonly agreed among urban planners and city building professionals that safe and efficient public transport is the best way for the future to make cities more sustainable. With these intentions in mind, the Delhi Metro was foreseen in the city of New Delhi and started its operations in 2002.

Fig. 4. 11 Representation of the Traffic Congestion in Delhi

(Source: www.ndtv.com)

Fig. 4. 12 Funny but true, a crowded bus in Delhi

(Source: www.ibnlive.com)

The original planning for a rail based transport system in Delhi started in 1970's when the government projected that a similar system would be required for mass public transportation in the future. Since then government appointed various committees to study the scope of development of mass rapid transport system (MRTS). At that time Delhi was perhaps the only city in the world, with such a huge size of its population depended on the over-crowded and insufficient bus services as the only public transport alternative. " This situation has led to the proliferation of personalised vehicles, so much so that Delhi has more registered vehicles than total number of vehicles in Mumbai, Calcutta and Chennai put together" (www.delhigovt.nic.in). Similar to the present situation in Mumbai, Delhi was also tackling with problems like traffic congestion, environmental pollution, rising number of road accidents, fuel wastage, etc. " Kolkata introduced a Metro railway system in the 1980's but the project exceeded its budget and completion schedule, seriously undermining the confidence of the

Government and the people in Metro systems” (Sreedharan, 2008 p. 57). During that period when the country’s development was sluggish, it was a gamble to once again trust a system that had failed miserably in the last attempt. Calcutta (now renamed to Kolkata) was a 17 kilometre long metro line which took 22 years for completion and the budget was overrun 14 times than what was initially planned (Sreedharan, 2008 p. 3). It was a tough decision to make especially when the available technology was inadequate and the time was running out. In such circumstances, Delhi Metro Rail Corporation was established in the year 1995 which was a joint venture of Government of India and Government of Delhi. Soon after its formation, the team began planning for one of the biggest projects in India. They had a tough task ahead. The DMRC received majority of its funding from Japan Bank for International Co-operation. The rest of the funds were raised by the State Government of Delhi and the Central Government of India.

Fig 4. 13 DMRC’s Profile Picture

(Source: www.dmrc.com)

One name that is prominently associated with DMRC and Delhi Metro is Dr. Elattuvalapil Sreedharan. Famous for his contribution as a CMD of Konkan Railway project along the western coast of India, this 760 kilometre long railway line joins three states of Maharashtra, Goa and Karnataka through criss-crossing rivers, plunging valleys and mountains that soar in to the clouds (www.konkanrailway.com). This challenging project marked the beginning of infrastructure development in India from 1990 onwards. Dr. E. Sreedharan took over as a Managing Director of DMRC in 1997. DMRC is

responsible to develop and maintain Metros in Delhi. The Delhi Metro Project is designed to cover 400 kilometres across the city in four phases by the year 2021 (Sreedharan, 2008). The time plan of the project is as follows:

Fig. 4. 14 Table showing the project outline of Delhi Metro

Phase

Initiation Date

Length covered (in kms)

Expected End Date

Actual End Date

Status

Phase I

1998

65

2008

2006

Fully Operational

Phase II

2007

128

2012

2011

Fully Operational

Phase III

2011

112

2015

—

On-going

Phase IV

—

108

2021

—

Queued

Source: adapted from DMRC website and Sreedharan, 2008

The table itself is enough to tell a tale of successful project management and an impeccable feat of construction carried out by the entire team of DMRC.

Dr. Sreedharan shot to fame overnight, being the first Indian to carry out such a difficult task with ease. Various Management Institutes and professionals wanted to know the secrets of his flawless management techniques which enabled him to deliver the project proficiently. Certainly this journey would not have been easy, but Dr. Sreedharan has set up a model of an efficient mass rapid transit system and at the age of 72 years and is wanted by every transportation authority board. The Delhi Metro Project instigated similar metro railway projects in different metropolitan cities across the country. His time and cost management skills grab everyone's attention. Further in the study we shall focus on time management aspects and try to analyse two main questions:

What were the problems in getting this project done on time?

What did he do that no one else could?

Issues that could have affected Project Time Management of Delhi Metro:

The Delhi Metro project was efficiently delivered on time. We look in to some of the problems which the project management team had to overcome to give out the best results. The below mentioned problems are commonly seen in Mumbai Metro Project too. There are not many differences in context of factors as both are government projects undertaken by the authorities to build an advanced commuting system. The only difference is that of the organisations building it and their management skills and structures. This

single difference makes them stand apart. Following are some of the
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problems which the Project Management team at DMRC had to go through during the course of construction of Delhi Metro:

Technology:

During the early years of 1990's, India had just begun taking steps towards technological advancements. After its economic reforms in 1991, India adopted three main policies of Liberalisation, Privatisation and Globalisation. In effect of these policies, trade regime and the regulatory framework was liberalised. Some of the industries were privatised and the country also hailed foreign investment in its economy (Sarvanakumar & Kim, 2012). India has been an agro-based country and during these economic reforms there was not much technological advancement happening. India had to import all the technical know-how needed for the Metro Project. In such circumstances, building such a big project was a huge risk. All credit to Dr. Sreedharan and his team for acquiring quality engineers and building such a magnificent project. The engineering team brought in many new technologies to this project like better telecommunication, automatic fare collection, advanced signalling, etc. Initially the materials were imported from foreign countries as per requirement but are now assembled in the country itself and have encouraged many local vendors to absorb these new technologies. " A showcase of the latest in railway technology, the Delhi Metro trains run on ' ballast less tracks' on the elevated viaduct and the underground corridor, thus minimising the need of tract maintenance and also reducing the running dimensions on the structure" (Sreedharan, 2008 p. 59). Moreover, these tracks have proven to be safer and provide a smooth ride to its commuters.

Tunnelling:

This procedure was necessary to construct the underground passage of the Delhi Metro. “ Tunnelling below the historic old Delhi area posed a major challenge, as the buildings there have weak foundations. It was therefore, decided to construct a tunnel at a depth of more than 20 meters”

(Sreedharan, 2008 p. 58). With the available technology it was a big challenge to build a tunnel this deep. Vehicle and Pedestrian traffic also posed as an obstacle in the tunnelling process. It was also a risk factor for the management team as mishaps could easily occur at a place with an extensive public access. There were also difficulties in tunnelling at some sections because of hard rock. For this purpose the project had obtained special cutter heads for their tunnel boring machines (Sreedharan, 2008). The team put in tremendous efforts to resolve the oncoming problems by finding and implementing solutions without any delays.

Fig. 4. 15 & 4. 16 Pictures of Tunnelling for Delhi Metro

Source: www.hindu.com

Substandard quality of work/ materials:

This is one of the most shocking revelations of the Delhi Metro Project. Poor quality of work, no regulations for standards of safety and substandard material used to build one of the finest projects which is going to be useful in the future for at least a century. What is more shocking is that these were not just one or two incidents which happened unfortunately. These are series

of accidents which were taking place one after the other in recent past.

Following table shows the accidents in detail:

Fig. 4. 17 List of Incidents occurred at the construction site of Delhi Metro

Date

Incident

No. of people killed/ injured

28. 08. 2007

A crane driver died as a concrete block fell on him due to technical failure

1 killed

21. 01. 2008

A construction worker died while carrying out burrowing work

1 killed

18. 07. 2008

A malfunctioning crane dropped 4 tonne iron beam on a passing car

2 injured

19. 10. 2008

An under construction flyover collapsed due to mechanical failure

2 killed and 30 injured

12. 07. 2009

Portion of under construction bridge collapsed as its launching girder lost balance while being erected

6 killed and 15 injured

13. 07. 2009

Three cranes toppled while lifting the entangled launcher under the debris of the collapsed bridge

4 injured

(Source: Mid-day, 2009 & The Times of India, 2009)

After all these mishaps which killed 10 people in all and injured around 50, the chief project manager and managing director of DMRC, Dr. Sreedharan sent his resignation from the post which shuddered all the concerned authorities related to this project. He said, “ I take full moral responsibility for the accident. As head of the organisation, I have to take the responsibility” (www. ndtv. com, 2009). The investigation revealed that the accident occurred on 12th of July 2009 was a design flaw in the pillar holding the structure (www. indianexpress. com, 2009). The honourable chief minister of Delhi, Mrs. Sheila Dixit inspected the site after the accident and immediately rejected Dr. E. Sreedharan’s resignation. She said “ We respect his sentiments. But we also know that the Delhi Metro and the country need

him. Not only has he done good work for Delhi but also for the country” (www. ndtv. com, 2009). Following this incident there has not been any other such incidents which exhibit the influence and power Dr. Sreedharan has on his team of members involved in the project.

Mumbai is nothing different in comparison with Delhi in context of quality of work carried out. In fact the organisation, MMRDA carrying out the work on Mumbai Metro was not wise enough to learn from the mistakes of Delhi Metro. Recently, a 50 feet long concrete slab collapsed from the Metro Railway’s under construction fly over. This incident killed 1 person and injured 16 more (The Times of India, 2012). This cannot be considered a mistake as it was a matter of sheer negligence by the authorities.

Such incidents not only cost financial losses but also result in loss of valuable time. Considering the importance of time management factor it is necessary to deploy personnel to ensure that all the safety standards are maintained at the construction site so as to prevent mishaps happening and also save a lot of time. Moving ahead we analyse the decision making of Dr. Sreedharan and its impact it had on the construction of Delhi Metro.

Fig. 4. 18 & 4. 19 showing the disaster of 12th of July.

Source: www. indianexpress. com

Fig 4. 20 toppled cranes amongst the tangled debris was the scene on 13th of July

Source: www. zeenews. india. com

Analysis:

Every major project has to through a series of difficulties. No one has a plan of how to deal with them. Because no one knows what kind of problem they might be dealing with. But an effective project manager has the capability of solving the problems with ease and importantly, he delivers the project within its scope. Delhi Metro too had to go through numerous obstacles in each phase of its construction. Some of them are mentioned above. But it was for the project management team who took up the initiative to keep the project within its planned time and cost. In the case of Delhi Metro, it was not just a single factor that led to a certain problem. There were events which summed up to become a bigger problem. For example tunnelling was not a big issue as many transport systems these days use this method. But adding to the outdated technology present in the country it became difficult to get the process done. Similarly the amount of population in Delhi is so much in excess that restricting public access was not possible. Therefore it became even more difficult to excavate during tunnelling and also maintain safety which resulted into many unfortunate mishaps. Undoubtedly this was the first massive project of its kind in India. Therefore this can provide a lot of valuable learning both positive and negative, to the project managers of the future.

Fig. 4. 21 The ' Metro Man' of India in action.

Source: [www. ibnlive. in. com](http://www.ibnlive.in.com)

By the end of Phase I of this project Dr. Sreedharan was an idol and inspirational leader to many management professionals and students.
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Everyone wanted to know what his secret behind his flawless management techniques was. He discusses the corporate values of Delhi Metro during one of his speeches at a management institute to the aspiring management professionals. Punctuality, Integrity, Transpar