



School	NBE	Subject Area & Catalogue number	BUSS 4009
Course Name	Project Management N		

Official Reading Time: 10 Minutes

Writing Time: 3 hours

Instructions to Candidates:

- Attempt any 4 (FOUR) questions
- All questions are of equal value
- This exam paper consists of 11 pages including the cover sheet and attached case study articles

Permitted Materials

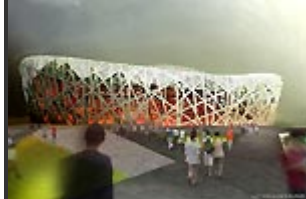
Open Book Exam

1. What is project scope? What was the scope of the National Stadium project in Beijing?
2. Define project success. Identify the project stakeholders for the National Stadium project in Beijing, and explain what would be a successful outcome for each of these stakeholders.
3. Define the project procurement processes identified by PMBOK<sup>®</sup> (2004)? The procurement strategy adopted for the National Stadium project in Beijing is a type of Public Private Partnership. Describe the set up of the PPP for the National Stadium project in Beijing, and discuss the advantages and disadvantages of using such a system for the project.
4. Discuss the various risk management approaches commonly employed in projects? Identify the 10 most likely risks associated with the Bird's Nest project, and classify them into various categories.
5. Describe in detail the use of the Earned Value Analysis technique for project control? Describe the factor which caused the National Stadium project in Beijing to exceed budget. Identify any other factors which you think are likely to cause a project such as this to exceed budget. For such a big project as the National Stadium, explain why it is important to carry out project forecasting on regular basis?
6. Distinguish the difference between project team organization and functional base organization? As the project team leader, advise the project manager as to suitable ways to promote team spirit on the National Stadium project in Beijing.

## National Stadium, Beijing, China



To earthquake-proof the stadium, the bowl and roof were split into two separate elements and the bowl split into eight zones, each with its own stability system and effectively its own building.



The £280 million National Stadium in Beijing will be a stunning landmark building for the 2008 Olympic Games.

The innovative structure was designed by Herzog & De Meuron Architekten, Arup Sport and the China Architecture Design & Research Group, and has been nicknamed the "Bird's Nest" due to the web of twisting steel sections that form the roof. As well as creating a modern stadium, the team was challenged with creating a venue that was part of the culture of China and that would put Beijing on the map.

The 91,000-seat stadium was designed to incorporate elements of Chinese art and culture; one of the design team is a Chinese artist. When the Olympics are finished the seating capacity will be reduced to 80,000.

### WORK PROGRESS

Construction work began on the stadium with earthworks and foundations in late 2003 and the main construction work started in March 2004. By August 2004 construction work had been halted due to the perceived high construction costs. The designers were asked to change the design to save money.

In the new design, the roof of the stadium was omitted completely. However, many experts believe that this will make the stadium safer from seismic activity, while significantly reducing construction costs. As a result of the design changes the total consumption of steel in the main structure is reduced by 22.3% from the original design.

Also, because the hole in the top of the stadium is now enlarged, the total surface of its membrane structure has been reduced by 13%. The construction of the Olympic building started once again at the beginning of 2005; hence the adjustment from the original finishing date of 2006 to the start of 2008.

### Project Summary

#### Budget

£280 million

#### Construction Time

3 years

#### Capacity

91,000 for Olympics, reduced to 80,000 afterwards

#### Height

69.2m above level pitch level

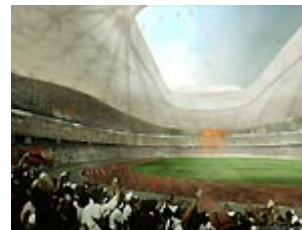
#### Size

3 million m<sup>3</sup>

#### Completion

2008 ready for Olympics

#### » Project Specifications



**The 100,000-seat National Stadium in Beijing is a multi-use sports venue and will be ready for the 2008 Olympic Games.**

## FINANCE

The China International Trust and Investment Corporation (CITIC) consortium, who raised 42% of the finance for the project in return for a 35 year tender after the Olympics are finished, comprises the CITIC Group, the Beijing Urban Construction Group, the Golden State Holding Group of the United States, and the CITIC Group affiliate Guoan Elstrong.

The remaining 58% is funded by the Beijing municipal government and this has been entrusted to the Beijing State-owned Assets Management Co Ltd as the city government's representative.

## NATIONAL STADIUM DESIGN

As this is an Olympic venue, there are many standards that the team have to conform to. Everything from the width of the track to the size and location of the long and high jump pits needs to satisfy the requirements set out by the International Olympic Committee (IOC) and the International Amateur Athletics Federation (IAAF).

The stadium also had to be designed for the Paralympics, which takes place after the Games. For this, the number of spaces for wheelchairs had to be increased considerably and put into various locations around the stadium, in both competitor and spectator areas.

The main requirements from the client, the National Stadium Company, which was established by the Beijing State-owned Assets Management Co Ltd, and the CITIC Consortium, were to create a bold, stand-out, world-class stadium, and to design in as much flexibility as possible for future use.

The stadium will host other sports such as football and events including concerts. One end of the stadium has amphitheatres that could be used to stage concerts once the grass is covered over.

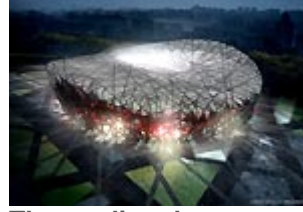
As well as getting the inside of the stadium right, the concourses and space around the stadium also had to be carefully thought out for future use. The concourses are very wide to allow people plenty of space to access the refreshment and merchandising stalls. This is integrated with a large mixed-use retail development under the plinth of the stadium, with shops, restaurants, cinemas, a health club and parking.

The new stadium could be home to the Beijing GuoAn football club that plays in the Chinese Super League after the 2008 summer Olympics are over. This move though has yet to be confirmed by the football club.

## CONTRACTORS AND CONSTRUCTION

Construction began on 23 December 2003 and is scheduled to be finish in early 2008. Beijing Mechanical Construction Company won the bid for earthwork and foundation treatment in November 2003 and work began almost immediately.

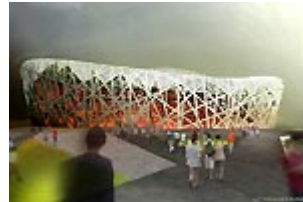
Structural engineering, mechanical and electrical engineering,



**The stadium has a moving roof so that the environment can be controlled.**



**The concourses are very wide to allow people plenty of space to move around, and for refreshments and merchandising stalls.**



**To earthquake-proof the stadium, the bowl and roof were split into two separate elements and the bowl split into eight zones, each with its own stability system and effectively its own building.**

fire safety engineering, acoustic design are the responsibility of Ove Arup & Partners. Beijing Urban Construction Group Co. Ltd (BUCG) is managing the project.

To minimise the formwork construction on the bowl, the design team have favoured the use of precast concrete. A terrace of 'L' shape precast units spanning areas between the supporting reinforced concrete in situ beams will make up the section of the middle and upper tiers. The stadium will be supported by 24 main columns of 1,000t each, which is far more than the weight of those in a conventional stadium and spaced in what appears to be a random pattern.

## **NATIONAL STADIUM ARCHITECTURE**

The team wanted to get an optimum balance between making sure every spectator had a good view, creating a good atmosphere and designing an elegant building. It also needed to be aware of the different uses of the stadium; for example, when used as an athletics stadium, the most important view is at the finish line of the running track but when used for football, the best views are at the centre line.

Getting everyone close enough in such a big venue was a real challenge and getting the calculations right was an immense task. For example, changing the height of the first row of seating by just 100mm would make the stadium significantly larger and higher and increase the cost by several million pounds.

To achieve the optimum design, the team relied heavily on parametric design software. This helped to work out the sightlines, the bowl geometry, airflow to keep the grass in good condition, seismic studies and to design the external envelope.

While the surface of the structure is simple, the geometry is complex – the calculations were so numerous and complicated that they could not be solved manually. Software was needed to make sure that the web of twisting steel sections fitted together, as they have to twist and bend to follow the surface accurately.

The spaces in the structure of the stadium are to be filled with inflated Ethylene TetrafluoroEthylene (ETFE) cushions. On the facade, the inflated cushions will be mounted on the inside of the structure where necessary, to provide wind protection. Since all of the facilities – restaurants, suites, shops and restrooms – are all self-contained units, it is possible to do largely without a solid, enclosed facade. This allows natural ventilation of the stadium, which is the most important aspect of the stadium's sustainable design.

To keep costs down, all the structural elements of the stadium are contained within it, so there are no towers or cable nets. The bowl of the structure is split into eight zones, each with its own stability system, making each zone effectively its own building.

**Source:** <http://www.designbuild-network.com/projects/national%5Fstadium/>

## ***Consortium Wins Bid for Main Stadium for the Beijing 2008 Olympics***

A consortium led by the China International Trust and Investment Corp (CITIC) won an ownership tender on Saturday for the National Stadium, the main stadium for the Beijing 2008 Olympic Games.

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Consortium Wins Bid  
for National Stadium

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The consortium will raise the funding for 42 per cent of the stadium's 3.5 billion-yuan (US\$423 million) cost.

The remaining 58 per cent, funded by the Beijing municipal government, has been entrusted to the Beijing State-owned Assets Management Co as the city government's representative.

The CITIC consortium comprises the CITIC Group, the Beijing Urban Construction Group, the Golden State Holding Group of the United States, and the CITIC Group affiliate Guoan Elstrong.

The signing ceremony for the deal was held on Saturday in Beijing. It is the first ownership tender for a venue for the 2008 Games.

Bidding for the National Stadium lasted for nine months and was overseen by the Supervisory Committee for the XXIX Olympiad to ensure openness and fair play.

The CITIC consortium and the Beijing State-owned Assets Management Co will jointly set up a company to work on the stadium project.

The project company will acquire a 30-year right to operate the National Stadium after the 2008 Games.

Besides financing part of the stadium, the CITIC consortium is also responsible for the construction and operation of the project.

Liu Jingmin, vice-mayor of Beijing and vice-chairman of the Beijing Organizing Committee for the Games of the XXIX Olympiad, told Saturday's signing ceremony: "This is good progress in the reform of the investment and financing system in Beijing."

The Beijing municipal government has decided to make the financing of the Games market-oriented through ownership tenders in an attempt to give full play to investment and the post-Games utilization of the facilities, according to sources with the Beijing Development Planning Commission, which organized the bidding.

Bidding is under way for another seven Olympic venues and facilities, including

the Olympic Village, the National Swimming Centre and the Wukesong Cultural and Sports Centre. The tenders will be allocated by October, said Liu Zhi, the commission's deputy director.

**Source: [http://english.people.com.cn/200308/11/eng20030811\\_122126.shtml](http://english.people.com.cn/200308/11/eng20030811_122126.shtml)**

## Beijing plans remain on schedule

Organisers of the 2008 Beijing Olympics say they are on course to deliver venues on schedule at the end of next year - despite construction problems.



Seventeen thousand people are working on building projects

Twenty of the 31 competition venues are under construction with work well underway on the centre-piece National Stadium and the Aquatic centre.

"We thought we were ahead of schedule but there have been some problems," said chief economist Wang Zhiyuan.

Organisers explained that "applying new technologies" is proving difficult.

Construction chief Jun Yuan added: "We have adopted new technologies unprecedented in China. There are some problems on the technology resource side which we are trying to tackle."

However, he denied that steel shortages - 110,000 tonnes are required for the National Stadium alone - were delaying the project.

**We are considering what to do if it rains. But I'm hoping 8 August 2008 will be a propitious day**

Construction chief Jun Yuan

"All the projects will be finished by the end of 2007, some of them by August or September 2007 to allow for testing," he said.

Sixteen of the hollow steel trusses that will hold in place the "Bird's Nest" roof of the 3.03 billion yuan (£216m) National Stadium are already clinging to the side of the concrete structure.

The equally-ambitious 1.02 billion yuan (£73m) Aquatic centre is at a less advanced stage.

Organisers are yet to decide what to do if it rains during the opening ceremony. They decided last year to abandon plans for a retractable roof for cost reasons.

"We are considering what to do if it rains," said Jun. "But I'm really hoping 8 August 2008 will be a propitious day."

**Source:** [http://news.bbc.co.uk/sport2/hi/other\\_sports/4852234.stm](http://news.bbc.co.uk/sport2/hi/other_sports/4852234.stm) (28 March 2006)

## **Supervisors stress quality of Olympic projects**

**(BEIJING, April 28) -- Supervisors of the 2008 Olympic Games affirmed on Friday that the construction of Olympic projects was carried on in line with the principle of 'safety, quality, construction time limit, function and cost'.**

They made the conclusion at the end of an inspection, which focused on the construction and supervision of the Olympic projects. Besides touring construction sites of projects like the National Stadium and National Aquatics Center, debriefing reports and reading files, they made a random check on the use and management of construction funds, subcontracting arrangement and tender activity monitoring.

They noted that remarkable progress had been made in the construction of the Olympic venues and the progress was steadily going on. A quality control system was established, the construction cost was within strict control, on-site safety was ensured to avoid major accidents and the projects were proven cost-effective.

The supervisors continued to stress the importance of the principle of safety, quality, construction time limit, function and cost, emphasizing the need to specify responsibilities of individuals, ensure safe production, consider post-Games use of the projects and enhance management and supervision to prevent any practice that goes against the law and discipline.

The inspection was conducted by the Supervision Committee of the Beijing 2008 Olympic Games led by Huang Shuxian, member of the Standing Committee of the Central Commission for Discipline Inspection of the Communist Party of China and vice minister of Supervision.

Officials of Beijing Municipal Government expressed readiness to act in accordance with the Committee's opinion and advice.

**Source: [beijing2008.com](http://beijing2008.com)**

## Post-Games Uses to Be Explored

What is going to happen to Beijing's economy after the 2008 Olympic Games? How to take advantage of the many Olympic venues after the competitions are over? Will Beijing have to pay a lot for their post-Games maintenance? Though it is still two years to go before the Games, Chinese scholars are already studying the post-Games issues. The following is a translation of an interview between Chen Jian, deputy president of the Beijing Olympic Economy Research Association, and the Chinese newspaper *Guangming Daily*.

The post-Olympic issue is a universal headache faced by almost all host cities. What do the post-Olympic risks include?

There are generally two sides to the issue. One is called the rock-bottom effect, the other is the utilization of Olympic venues after the Games.

During the preparations for the Olympic Games, investment usually surges dramatically due to the mass construction of Olympic venues and urban infrastructural facilities. For instance, Beijing is expected to invest more than 180 billion yuan (US\$22.5 billion) in the construction of infrastructure during its preparations for the Games. However, when the Games comes to an end, such investments will decline considerably. If the city fails to take precautions ahead, its economy might suffer a low growth rate or even slow to a standstill, which would do harm to the city's economic development in the long term. The rock-bottom effect takes place because economic growth is pulled back by the drop in investment.

And how to use the Olympic venues after the Games is another hard nut to crack. Beijing has been building a number of new sports venues for the Games. However, these venues would be left idle after 2008 if we do not think of how to use them ahead. The annual maintenance fees alone would be a huge financial burden to the host city.

Do you have any suggestions on how Beijing could avoid such a scenario?

From my point of view, city planners should readjust the urban development plan. Now, most of the Olympic venues and related facilities are located in the northern part of the city. The municipal government should take administrative and economic measures to encourage private capital to be invested in the southern part and the outskirts of the city, in order to avoid too much concentration of investment in the downtown area.

And the city leaders should consider how to arrange the fixed asset investment in a more balanced way so as to prevent a sharp decline of investment after the Games. For instance, the city could postpone some projects that are not urgent and have little connection with the Games, and then launch them after 2008.

What can we do to reduce risks of limited post-Games use of our Olympic venues?

First, we should take full consideration of how the venues could serve the public in the long run during the design. And the city has cut off some projects and plans to use more temporary buildings and facilities, which can reduce some risks.

Second, the government should encourage more private capital in the construction and management of Olympic venues. I'm glad to see that private capital is more than half of the total investment in the venue

construction.

Third, the designers should equip the venues with various functions, which may increase their post-Games utility. For instance, in the central Olympic area in northern Beijing, there are not only sports arenas like the National Stadium and the National Aquatic Center, but also shopping malls, exhibition halls, hotels and many other auxiliary buildings, which are good for post-Games use.

Last but not the least, proper management and operation mechanisms are of great importance. At present, many comprehensive sports venues in China are rented separately to different individuals and companies. This situation hampers the full use of the venues and brings many inconveniences to customers. We should introduce professional management companies and integrate all the resources of sports venues. This may reduce costs and lengthen the usage period of each venue.

**Source: *China Daily* August 18, 2006**