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SCAF Workshop
**“The SCAF 2018 Cost Estimating
Challenge”**

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Aerospace Bristol

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The background features several overlapping circles in various shades of purple and magenta, creating a modern, abstract design.

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SCAF Conference Case Study Workshop

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Introduction

Sam Tomkins

- Cost Engineer within Nuclear.
- Started the role in July 2017.
- Completed a Mechanical Engineering Apprenticeship previously.



Melissa Worrall

- 4th Year Project Controls Apprentice with 4 Months left until the completion of my apprenticeship.
- Currently Working as a Planner for a project within Nuclear.
- Started working for Wood in September 2014.



Jonathan Shepherd

- 4th Year Project Controls Apprentice with 4 Months left until the completion of my apprenticeship with experience working on a major EPC project on Sellafield site.



Purpose and Scope

Understanding the Problem Space

Purpose and Scope

The scope of our project was to provide a fit for purpose security service for the 2018 FIFA World Cup to ensure the prevention of incidents such as riots and terror attacks taking place. Accounting for the magnitude and high profile status of the games.



General Data Gathering Approach

General Data Gathering approach

Assumptions and Exclusions

- We will only provide the manpower aspects of the security.
- We will only provide cover for the first day of the 2018 FIFA World cup then multiplying and scale for the other games taking place. Eg. Opening game security costs £10k therefore the Whole Cost would be £10k x total amount of games. Potentially adding an x% uplift for games with higher risk (the semi-finals/ final etc.). A Whole Life Cost estimate will be provided.
- As the only Match on this day features Russia, and Russia are the hosts we will assume the stadium will be at full capacity (81,000 people).



General Data Gathering approach

Data Sources

Match Information - <http://www.fifa.com/worldcup/matches/index.html>

Stadium Information - <http://www.football-stadiums.co.uk/grounds/russia/>

Rate information for security -

https://www.payscale.com/research/UK/Job=Security_Officer/Hourly_Rate



General Data Gathering Approach

Data Normalisation

In order to best estimate the cost of providing security for the 2018 FIFA World Cup we took the Average rates of London security personnel. We took into account the rate v experience of the personnel we planned on employing and decided that taking the average overall would give us a more rounded team of security.

Example:

We decided to employ Security Officers at a £9.01 rate with an average of 3 years experience each and Security Specialists to oversee the security at a rate of £12.35 with an average of 10 years experience each.



Data Analysis

Data Analysis

Explanation of figures provided

Taking the assumptions/exclusions, an estimated number of security personnel and an average wage into account an estimate was created.

For the 81,000 capacity stadium there will be 450 Security Officers and 50 Security Specialists to oversee them.

All security personnel will be working an 8 hour shift.



Data Analysis

Explanation of figures provided

The below figures were used to create a base estimate for the first game and were used to evaluate a Whole Life Cost estimate.

Personnel	Hourly Rate	Length Of Shift	No. of persons
Security Officer	£9.01	8 Hours	450
Security Specialist	£12.35	8 Hours	50



Data Analysis

Opinions regarding the data maturity

The data collected is accurate to reflect the median wage in 2018 for security personnel in the UK, specifically London. This allows for higher accuracy levels as inflation and other variables are not an issue.



Data Analysis

Cost Estimates.

Discipline	Hourly Rate	Length of Shift	No. of personnel
Security Officer	£9.01	8 Hours	450
Security Specialist	£12.35	8 Hours	50

Discipline	Cost per shift, per person (Hourly rate x Length of shift)	Total Cost per Discipline (Cost per shift, per person x No. of personnel)	Overall Costs (Discipline totals combined)
Security Officer	£72.08	£32,436.00	£37,376.00
Security Specialist	£98.80	£4,940.00	



Data Analysis

Whole Life Cost

With a base estimate made against the opening game, a Whole Life Cost for security man power was created by scaling the original estimate by stadium capacities. A % uplift was also included as the tournament progresses due to the potential for any issues occurring.

The total estimated Whole Life Cost for the supply of security manpower totals £ 1,884,236.72



Data Analysis

Whole Life Cost

Stadium	Capacity	Security Officers	Security Specialists
Ekaterinburg Arena	35,000	225	25
Fisht Stadium	48,000	275	25
Kaliningrad Stadium	35,000	225	25
Kazan Arena	45,000	275	25
Mordovia Arena	44,500	275	25
Nizhny Novgorod Stadium	45,000	275	25
Rostov Arena	45,000	275	25
Saint Petersburg Stadium	64,000	370	30
Cosmos Arena	45,000	275	25
Spartak Stadium	45,000	275	25
Volgograd Arena	45,500	275	25
Luzhniki Stadium	81,000	450	50



Data Analysis

Whole Life Cost Breakdown – Group Stage

Stadium	Security Officer Cost	Security Specialist Cost	Total Cost per Game	No. of Games	Total cost per Stadium
Ekaterinburg Arena	£16,218.00	£2,470.00	£18,688.00	4	£74,752.00
Fisht Stadium	£21,624.00	£2,470.00	£24,094.00	4	£96,376.00
Kaliningrad Stadium	£16,218.00	£2,470.00	£18,688.00	4	£74,752.00
Kazan Arena	£19,822.00	£2,470.00	£22,292.00	5	£111,460.00
Mordovia Arena	£19,822.00	£2,470.00	£22,292.00	4	£89,168.00
Nizhny Novgorod Stadium	£19,822.00	£2,470.00	£22,292.00	5	£111,460.00
Rostov Arena	£19,822.00	£2,470.00	£22,292.00	4	£89,168.00
Saint Petersburg Stadium	£26,669.60	£2,964.00	£29,633.60	6	£177,801.60
Cosmos Arena	£19,822.00	£2,470.00	£22,292.00	5	£111,460.00
Spartak Stadium	£19,822.00	£2,470.00	£22,292.00	5	£111,460.00
Volgograd Arena	£19,822.00	£2,470.00	£22,292.00	4	£89,168.00
Luzhniki Stadium	£32,436.00	£4,940.00	£37,376.00	5	£186,880.00



Data Analysis

Whole Life Cost Breakdown – Last 16

Stadium	Security Officer Cost	Security Specialist Cost	Total Cost per Game	No. of Games	Total cost per Stadium
Fisht Stadium	£21,624.00	£2,470.00	£24,094.00	1	£24,094.00
Kazan Arena	£19,822.00	£2,470.00	£22,292.00	1	£22,292.00
Nizhny Novgorod Stadium	£19,822.00	£2,470.00	£22,292.00	1	£22,292.00
Saint Petersburg Stadium	£26,669.60	£2,964.00	£29,633.60	2	£59,267.20
Cosmos Arena	£19,822.00	£2,470.00	£22,292.00	1	£22,292.00
Spartak Stadium	£19,822.00	£2,470.00	£22,292.00	1	£22,292.00
Luzhniki Stadium	£32,436.00	£4,940.00	£37,376.00	1	£37,376.00



Data Analysis

Whole Life Cost Breakdown – Quarter-finals (25% Uplift)

Stadium	Security Officer Cost	Security Specialist Cost	Total Cost per Game	No. of Games	Total cost per Stadium
Fisht Stadium	£24,795.52	£3,062.80	£27,858.32	1	£27,858.32
Kazan Arena	£24,795.52	£3,062.80	£27,858.32	1	£27,858.32
Nizhny Novgorod Stadium	£24,795.52	£3,062.80	£27,858.32	1	£27,858.32
Cosmos Arena	£24,795.52	£3,062.80	£27,858.32	1	£27,858.32



Data Analysis

Whole Life Cost Breakdown – Semi-Finals & 3rd Place Play-Off (50% Uplift)

Stadium	Security Officer Cost	Security Specialist Cost	Total Cost per Game	No. of Games	Total cost per Stadium
Spartak Stadium	£29,769.04	£3,655.60	£33,424.64	1	£33,424.64
Luzhniki Stadium	£48,654.00	£7,410.00	£56,064.00	1	£56,064.00
Luzhniki Stadium	£48,654.00	£7,410.00	£56,064.00	1	£56,064.00



Data Analysis

Whole Life Cost Breakdown – Final (100% Uplift)

Stadium	Security Officer Cost	Security Specialist Cost	Total Cost per Game	No. of Games	Total cost per Stadium
Luzhniki Stadium	£81,090.00	£12,350.00	£93,440.00	1	£93,440.00



Data Analysis

Whole Life Cost – Overview (Total cost £ 1,884,236.72)

Stadium	Group Stage Cost	Last 16 Cost	Quarter-Finals Cost	Semi-Finals & 3 rd Place Play-Off	Final Cost
Ekaterinburg Arena	£74,752.00				
Fisht Stadium	£96,376.00	£24,094.00	£27,858.32		
Kaliningrad Stadium	£74,752.00				
Kazan Arena	£111,460.00	£22,292.00	£27,858.32		
Mordovia Arena	£89,168.00				
Nizhny Novgorod Stadium	£111,460.00	£22,292.00	£27,858.32		
Rostov Arena	£89,168.00				
Saint Petersburg Stadium	£177,801.60	£59,267.20			
Cosmos Arena	£111,460.00	£22,292.00	£27,858.32		
Spartak Stadium	£111,460.00	£22,292.00		£33,424.64	
Volgograd Arena	£89,168.00				
Luzhniki Stadium	£186,880.00	£37,376.00		£112,128.00	£93,440.00



Data Analysis

Whole Life Cost

With a base estimate made against the opening game, a Whole Life Cost for security man power was created by scaling the original estimate by stadium capacities. A % uplift was also included as the tournament progresses due to the potential for any issues occurring.

The final estimated Whole Life Cost totals £1,884,236.72



Additional Ground Rules and Assumptions

Additional Ground Rules and Assumptions

Assumptions and Exclusion with Justification

- We will cover the full match and 3 hours either side with respect to manpower to capture the need for security sweeps before and after the games have taken place.
- We will not capture the need to have additional security staff patrolling outside of the stadium boundaries because the Russian government have employed 'Tourist Police' to meet this need.
- Information on Russia in general is scarce. We have worked under the assumption wages correlate across from the UK.



Additional Ground Rules and Assumptions

Sensitivity Analysis

A **sensitivity analysis** is a technique used to determine how different values of an independent variable impact a particular dependent variable under a given set of assumptions.

Bag checks etc. every 50th bag checked twice.



Decision and Rationale as to How the Task was Conducted.

Decision and Rationale as to How the Task was Conducted.

Firstly we started by splitting the task into three main phases.

- Phase 1 – Research.
- Phase 2 – Estimating.
- Phase 3 – Gathering all team members slides and creating the PowerPoint.

We then Delegated tasks within each Phase between the three of us and set up a weekly meeting of 20 minutes on a Friday to ensure the task was progressing appropriately.



Lessons Learnt

Lessons Learnt

Time Management

One lesson we learnt is to better manage our time. We had accounted a small amount of time every week within our schedule to produce a different part of the project. We had initially estimated the weighting of each of the modules that needed to be discussed in our presentation and decided an amount of time that would be needed to complete this part. We then revisited the *Sensitivity Analysis* part of our presentation and decided we would need to make a whole other model to best demonstrate what the impact of a different set of assumptions would have on our projects.



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