



CM0343 – Large Individual Project

Olympic Diving Results Information System

Final Report

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3/5/2013

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Abstract

This report continues on from my interim report and concludes my final year project- designing and implementing an Olympic Diving Results Information System. The system is a dynamic web based application, powered by the Olympic Data Feed: sets of XML messages that are processed live to a database to reflect competition standings and statistics. Building upon existing solutions, the application will allow users to predict scores and gain points as events progress. In the interim report I had created a design and small prototype to assess the feasibility of my project and solution. This report continues into the full development of a complete working prototype, including evaluation and reflection on both the application produced and the project itself.

Contents

Introduction	1
Overview	1
Interim Report Conclusions	1
Next Steps	2
Message Processing and Database Implementation	2
Project Plan Revision.....	2
ODF Processor Continued	3
Database Continued.....	3
User Interface Design.....	6
Detailed Layout	7
Graphical	11
Improvement	13
Static Implementation	14
Web Application Implementation.....	19
Project Plan Revision.....	19
Core Functionality	19
Results.....	20
HTML5 Video.....	20
Results Page Basics	20
Start List	21
Live Content	21
AJAX refresh	24
Medallists.....	26
Score Prediction	27
Points	27
Input.....	27
Results.....	29
History and Leader Board	31
Static Content	32
Extras and Changes.....	33
Completion.....	34
Testing.....	37
Functional Testing.....	38

Usability Evaluation.....	40
User Testing	41
Results and Evaluation	43
Project Results	43
Future Work.....	45
Project Management Evaluation	47
Conclusion and Learning Outcomes	48
Bibliography	49

Table of Appendices

Project Plan Version 4.....	Appendix A
ODF Processor Code.....	Appendix B
Static Implementation Code.....	Appendix C
Project Plan Version 5.....	Appendix D
Implementation of Core Elements of Web Application.....	Appendix E
Test Cases.....	Appendix F
Project Plan Version 6.....	Appendix G
ODF Sender Code.....	Appendix H
Web Application Code.....	Appendix I
User Feedback Questionnaires.....	Appendix J

Introduction

Overview

The aim for this project is to implement a Results Information System for Olympic Diving, powered by the Olympic Data Feed (A live feed of XML messages used at the Olympic Games that contains results information such as scores, rankings and start lists). The results information system will be comprised of four main components:

- Simulating the ODF message feed used at the games through a Java application, that will be used to power the information system as if it was “live” during the Olympic Games.
- Processing the messages in the Java application and inserting the data into a database on a server.
- Creating a PHP web application that uses the database and dynamically updates with results standings as the event is simulated by the ODF feed.
- Integrating user interaction into the web application, so that users can play along by predicting scores and gaining points as the events progresses.

The main differing aspect between this project and the real systems implemented at the Olympic Games is that it will be focussing on integrating user interaction (e.g. Allowing users to predict scores) in to the system, where as the real systems were purely designed for information absorption.

The audience for the resulting application of this project focuses on sports fans interested in following live results of sporting events. In this case, I am using Olympic Diving as an example due to my experience at LOCOG (my experience being my knowledge of the competition format and rules and knowledge of the data feed) in order to simplify the implementation of what could otherwise become a massively complex project.

The project scope is to make a working prototype and not a feature-packed application that is ready to be used in the real world. Being based on the Olympic Games, the application has the potential to take an extremely long amount of time, which would be impractical given the time restrictions on this project and that it is only being worked on by a single person.

Please refer to the interim report for more detailed information.

Interim Report Conclusions

During the time period up to the conclusion of the interim report, a basic design for the results information system was created, and a very basic prototype to test the feasibility of the proposed solution was developed. This involved modelling the aspects of the system including the database and system flow. The basic prototype allows the ODF messages to be sent from an application, it then processes a participants message (DT_PARTIC), a team participants message (DT_PARTIC_TEAMS) and a start list message (DT_START_LIST). The data from these messages is inserted into a database on a server. A PHP page then queries the database, and prints a start list with competitors and dive lists to the browser. In getting to this stage, I have completed the following design and implementation:

- Detailed requirements

- System components and flow
- Database schema
- Basic web application user interface and navigation design
- Fully designed and implemented java program to send messages
- Implementation of partial message processing
- Implementation of database and partial tables

In the interim report I concluded that I believe that the project is currently on track to meet the aims and deliverables set out. After building a basic prototype based on this design, I believe that my design ideas have been justified as the prototype has been successful- proving that the design is a feasible one. I think this prototype has provided a strong platform to build the full application from as I continue the design and implementation processes into this final report.

Next Steps

This final project report covers the period of design and development beginning immediately after interim report submission. At the conclusion of the interim report it was important to acknowledge that the design and prototype are so far very basic, and represent a very small portion of the overall system. There is still a lot of more detailed design work to complete, and the final implementation will be far more complex than what has been achieved at this point. The project now moves forward into implementing the full system. This will involve iteratively developing the results application functionality, along with its graphical user interface and incorporating user prediction. I concluded that in order to make sure these elements are carried out successfully I will need to complete more detailed design for the web application. Immediately, the next step is to begin designing these more detailed elements of the application, such as detailed layouts, user interface, how the user prediction will work etc. I will also need to complete implementing the database and message processing before I begin implementing the main web application as this cannot function properly with incomplete data.

Message Processing and Database Implementation

Project Plan Revision

Immediately after the interim report submission, I planned to continue working into the Christmas break and working on a more detailed design for the web application user interface. However, I am now making changes to this plan and I am instead going to continue implementing message processing and database structures first. These two tasks are independent of each other, however both need to be completed before implementation of the web application can begin, so it doesn't make a great deal of difference which I order I complete them in. I am therefore going to finish implementing message processing and the database structure first because I have recently been working on this for the basic prototype. I think it will be simpler if I continue this work rather than stopping and having to spend time relearning elements of the program after the January exam period.

I originally planned to spend a day creating cleaning functions to help reset my database during testing and development, however, now that I know I am using phpmyadmin and have begun implementing the database I don't feel this is necessary any longer. This is because phpmyadmin has

a graphical user interface that makes it simple to remove and edit records and I feel this will suffice in order to reset the database for testing and demonstration purposes.

I originally scoped to conduct a usability evaluation of my user interface after creating a detailed design in order to improve the user interface. However, I now feel this will be more appropriate after I have implemented the majority of the application as problems during implementation could significantly alter the design. It is still very important to get some kind of evaluation to improve on my design, so I still plan to obtain some user feedback in order to make adjustments and improvements, but I don't think that a full scale evaluation is appropriate at that stage.

Please see Appendix A for the revised project plan chart.

ODF Processor Continued

So far, we have implemented processing of participants, team participants and start list messages. This will now be continued by developing the ODF Processor and implement processing of:

- DT_SCHEDULE- sent before any other messages to load the schedule information (events, dates, start times etc.) into the database.
- DT_SCHEDULE_UPDATE sent to update the status of an event to "in progress", "unofficial" or "official".
- DT_RT_RESULTS sent before and after each dive to update the results.
- DT_MEDALLISTS sent at the end of competition containing the winners of each medal.

This processing will involve extracting data from the XML documents and then inserting and updating the database appropriately. The full details of this implementation can be found in Appendix B.








Database Continued

With the ODF message processing now complete, we can now see the full structure of the results elements of the database and observe how the data reflects the current state of the events.

So first we process the DT_SCHEDULE message to get a list of events with dates and times. We only make use of four of the event codes in this system (the 4 that represent the synchronised final events) as other codes are used to represent individual events, draws and medal ceremonies (these are out of scope for this project). The status represents the current state of the event. This system uses:

- 2 – scheduled
- 4 – in progress
- 6 – unofficial
- 7 – official

There are other possible values for the status, but these involve unusual scenarios such as rescheduled and cancelled which are not in scope for this project. The status is updated by DT_SCHEDULE_UPDATE messages. We then use round to indicate the current round of the event when that event is in progress so we know which dive information to display.

			code	date	start_time	end_time	status	round
			DVM201101	2012-08-01	15:00:00	15:00:00	4	1
			DVM202101	2012-07-30	15:00:00	15:00:00	2	1
			DVW201101	2012-07-29	15:00:00	15:00:00	7	5
			DVW202101	2012-07-31	15:00:00	15:00:00	2	1

Events table

DT_PARTIC fills the athlete table with information about each athlete. DT_PARTIC_TEAMS is then processed, giving information for each team and assigning two athletes to each.

code	family_name	given_name	gender	dob	noc	code	noc	name	athlete1	athlete2
1016603	Bazhina	Nadezda	W	1987-12-29	RUS	DVM201CAN01	CAN	Canada	1076596	1107755
1016604	Galperin	Gleb	M	1985-05-25	RUS	DVM201CHN01	CHN	China	1072156	1072157
1016607	Zakharov	Ilya	M	1991-05-02	RUS	DVM201GBR01	GBR	Great Britain	1079034	1079036
1016608	Koltunova	Yulia	W	1989-05-04	RUS	DVM201MAS01	MAS	Malaysia	1019758	1122382
1016610	Kuznetsov	Evgeny	M	1990-04-12	RUS	DVM201MEX01	MEX	Mexico	1083937	1083957
1016611	Minibaev	Victor	M	1991-07-18	RUS	DVM201RUS01	RUS	Russia	1016607	1016610
1016615	Pozdniakova	Anastasiia	W	1985-12-11	RUS	DVM201UKR01	UKR	Ukraine	1038863	1038875
1019758	Lomas	Bryan Nickson	M	1990-06-30	MAS	DVM201USA01	USA	United States	1132374	1132778
1019761	Pamg	Pandelela Rinong	W	1993-03-02	MAS	DVM202CHN01	CHN	China	1072164	1072165
1023639	Nakagawa	Mai	W	1987-04-07	JPN	DVM202CUB01	CUB	Cuba	1079361	1079363
1036236	Kaptur	Vadim	M	1987-07-12	BLR	DVM202GBR01	GBR	Great Britain	1079028	1176898
1036241	Hordeichik	Timofei	M	1986-01-04	BLR	DVM202GER01	GER	Germany	1122280	1122288
1038861	Pysmenska	Anna	W	1991-03-12	UKR	DVM202MEX01	MEX	Mexico	1083948	1083951
1038862	Bondar	Oleksandr	M	1993-10-25	UKR	DVM202RUS01	RUS	Russia	1016607	1016611
1038863	Kvasha	Illya	M	1988-03-05	UKR	DVM202UKR01	UKR	Ukraine	1038862	1038872
1038866	Potyekhina	Viktoriya	W	1993-05-14	UKR	DVM202USA01	USA	United States	1131218	1133319
1038868	Zakharov	Anton	M	1986-02-13	UKR	DVW201AUS01	AUS	Australia	1090476	1090477
1038872	Gorshkovozov	Oleksandr	M	1991-07-18	UKR	DVW201CAN01	CAN	Canada	1102652	1107754
1038873	Fedorova	Olena	W	1986-11-14	UKR	DVW201CHN01	CHN	China	1072143	1072144
1038874	Prokopchuk	Iuliia	W	1986-10-23	UKR	DVW201GBR01	GBR	Great Britain	1079025	1079030
1038875	Prygorov	Oleksiy	M	1987-06-25	UKR	DVW201ITA01	ITA	Italy	1062459	1062466
1043855	Yeoh	Ken Nee	M	1983-04-30	MAS	DVW201MAS01	MAS	Malaysia	1019761	1123025
1058025	Eskilsson	Christofer	M	1989-04-20	SWE					

Athletes table

Teams table

When DT_START_LIST is sent, the results table is populated with the start order and sort order for each team. Each teams dive list is inserted into the dives table. The rest of the fields are set to NULL so they are ready to be updated when the event begins and then as it progresses.

event	competitor	start_order	current	previous	rank	equal_rank	sort_order	total	medal
DVW201101	DVW201ITA01	1	NULL	NULL	NULL	NULL	1	NULL	NULL
DVW201101	DVW201AUS01	2	NULL	NULL	NULL	NULL	2	NULL	NULL
DVW201101	DVW201CHN01	3	NULL	NULL	NULL	NULL	3	NULL	NULL
DVW201101	DVW201GBR01	4	NULL	NULL	NULL	NULL	4	NULL	NULL
DVW201101	DVW201USA01	5	NULL	NULL	NULL	NULL	5	NULL	NULL
DVW201101	DVW201CAN01	6	NULL	NULL	NULL	NULL	6	NULL	NULL
DVW201101	DVW201MAS01	7	NULL	NULL	NULL	NULL	7	NULL	NULL
DVW201101	DVW201UKR01	8	NULL	NULL	NULL	NULL	8	NULL	NULL

Results table

competitor	dive_number	dive_code	description	difficulty	E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	pen	avg	score
DVW201AUS01	1	201B	Back Dive	2.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201AUS01	2	301B	Reverse Dive	2.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201AUS01	3	405B	Inward 2 1/2 Somersault	3.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201AUS01	4	107B	Forward 3 1/2 Somersault	3.1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201AUS01	5	5152B	Forward 2 1/2 Somersault 1 Twist	3.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201CAN01	1	401B	Inward Dive	2.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201CAN01	2	101B	Forward Dive	2.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201CAN01	3	205B	Back 2 1/2 Somersault	3.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201CAN01	4	305B	Reverse 2 1/2 Somersault	3.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201CAN01	5	5152B	Forward 2 1/2 Somersault 1 Twist	3.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201CHN01	1	101B	Forward Dive	2.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201CHN01	2	5331D	Reverse 1	2.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Dives table

A DT_RT_RESULT message is sent, which first sets the current athlete, flagged with an 'X' in the current field.

event	competitor	start_order ▲	current	previous	rank	equal_rank	sort_order	total	medal
DVW201101	DVW201ITA01	1	X	NULL	NULL	NULL	1	NULL	NULL
DVW201101	DVW201AUS01	2	NULL	NULL	NULL	NULL	2	NULL	NULL
DVW201101	DVW201CHN01	3	NULL	NULL	NULL	NULL	3	NULL	NULL
DVW201101	DVW201GBR01	4	NULL	NULL	NULL	NULL	4	NULL	NULL
DVW201101	DVW201USA01	5	NULL	NULL	NULL	NULL	5	NULL	NULL
DVW201101	DVW201CAN01	6	NULL	NULL	NULL	NULL	6	NULL	NULL
DVW201101	DVW201MAS01	7	NULL	NULL	NULL	NULL	7	NULL	NULL
DVW201101	DVW201UKR01	8	NULL	NULL	NULL	NULL	8	NULL	NULL

Results table- team becomes "current"

The next result message sets the team to previous, and updates their rank, equal rank (Y or N to indicate if multiple teams have the same rank), sort order and total as necessary. It then updates the scores for the dive that was just performed in the dives table.

event	competitor	start_order ▲	current	previous	rank	equal_rank	sort_order	total	medal
DVW201101	DVW201ITA01	1	NULL	X	1	N	1	52.20	NULL
DVW201101	DVW201AUS01	2	NULL	NULL	NULL	NULL	2	NULL	NULL
DVW201101	DVW201CHN01	3	NULL	NULL	NULL	NULL	3	NULL	NULL
DVW201101	DVW201GBR01	4	NULL	NULL	NULL	NULL	4	NULL	NULL
DVW201101	DVW201USA01	5	NULL	NULL	NULL	NULL	5	NULL	NULL
DVW201101	DVW201CAN01	6	NULL	NULL	NULL	NULL	6	NULL	NULL
DVW201101	DVW201MAS01	7	NULL	NULL	NULL	NULL	7	NULL	NULL
DVW201101	DVW201UKR01	8	NULL	NULL	NULL	NULL	8	NULL	NULL

Results table – team becomes previous

DVW201GBR01	4	5152B	Forward 2 1/2 Somersault 1 Twist	3.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201GBR01	5	205B	Back 2 1/2 Somersault	3.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
DVW201ITA01	1	101B	Forward Dive	2.0	8.5	8.5	8.5	8.5	8.5	9.0	9.0	8.5	9.0	8.5	9.0	0.0	8.7	52.20
DVW201ITA01	2	301B	Reverse Dive	2.0	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Dives table – team becomes previous

This process now continues throughout the event. When the next DT_RT_RESULT is processed, the “X” is removed from the previous teams “current” field, and the next team becomes current. The next message removes the “X” from the “previous” team and the next team becomes previous, with their dive scores updated in the database. Each time a result message is sent, it will include any updates to ranks, sort orders and totals as necessary, so these will also be updated in the results table.

event	competitor	start_order	current	previous	rank	equal_rank	sort_order	total	medal
DVW201101	DVW201ITA01	1	NULL	NULL	2	N	2	52.20	NULL
DVW201101	DVW201AUS01	2	NULL	NULL	3	N	3	49.20	NULL
DVW201101	DVW201CHN01	3	NULL	X	1	N	1	54.00	NULL
DVW201101	DVW201GBR01	4	NULL	NULL	NULL	NULL	4	NULL	NULL
DVW201101	DVW201USA01	5	NULL	NULL	NULL	NULL	5	NULL	NULL
DVW201101	DVW201CAN01	6	NULL	NULL	NULL	NULL	6	NULL	NULL
DVW201101	DVW201MAS01	7	NULL	NULL	NULL	NULL	7	NULL	NULL
DVW201101	DVW201UKR01	8	NULL	NULL	NULL	NULL	8	NULL	NULL

Results table – event continues

When DT_MEDALLISTS is processed, the name of the medal is updated for the appropriate teams in the results table.

event	competitor	start_order	current	previous	rank	equal_rank	sort_order	total	medal
DVW201101	DVW201ITA01	1	NULL	NULL	4	N	4	314.10	NULL
DVW201101	DVW201AUS01	2	NULL	NULL	5	N	5	304.95	NULL
DVW201101	DVW201CHN01	3	NULL	NULL	1	N	1	346.20	GOLD
DVW201101	DVW201GBR01	4	NULL	NULL	7	N	7	285.60	NULL
DVW201101	DVW201USA01	5	NULL	NULL	2	N	2	321.90	SILVER
DVW201101	DVW201CAN01	6	NULL	NULL	3	N	3	316.80	BRONZE
DVW201101	DVW201MAS01	7	NULL	NULL	8	N	8	283.50	NULL
DVW201101	DVW201UKR01	8	NULL	X	6	N	6	302.40	NULL

Results table- medallists sent

User Interface Design

In the interim report, the basic layout of the pages for the web application were defined and designed. This design will now be continued into greater detail as we need to plan the layout of the event pages in much greater detail to aid the implementation. The other features of the user interface such as colour scheme and font also need to be designed. We can then implement the HTML pages with styling and no dynamic content. This will allow us to check the design can be physically achieved in the browser and will then act as a template which the dynamic PHP elements can be introduced into.

Detailed Layout

The following are detailed designs for the content area of the event pages at each different stage of the event.

Scheduled

Event Name
Date Time – Scheduled

No start list available at this time

Video Stream

Start List

Event Name
Date Time – Scheduled

Video Stream

Start List

Start Order	Team			
1	CHN	Athlete 1	Athlete 2	
...				
Dive No.	Dive Code	Description	Position	Difficulty
1	201B	Backward Dive	Pike	2.0
2	201B	Backward Dive	Pike	2.0
...table continued				
2	RUS	Athlete 1	Athlete 2	
...table continued				

Sub-table under each team shows dive list

In Progress

Event Name
Date Time – In Progress

Current Team

Rank	Team		Total
3	Russia	Athlete 1	50.80
		Athlete 2	

Dive No.	Dive Code	Description	Position	Difficulty
1	201B	Backward Dive	Pike	2.0

Live Predictions

Video Stream

Previous Team

Rank	Team		Total
2	China	Athlete 1	50.80
		Athlete 2	

Dive No.	Dive Code	Description	Position	Difficulty
1	201B	Backward Dive	Pike	2.0

E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score
7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.0	7.0	52.40

Standings

Start Order															
1		Team													
1		CHN		Athlete 1				Athlete 2							
...															
Dive No.		Dive Code		Description				Position		Difficulty					
1		201B		Backward Dive				Pike		2.0					
E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score		
7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.0	7.0	52.40		
...table continued															
2		RUS		Athlete 1				Athlete 2							
...table continued															

Dive information for the current team

Results for the previous team

Sub-table under each team shows detailed dive results so far

Unofficial / Official

Event Name
Date Time – Official

Video Stream

Results

Start Order	Team															
1	CHN		Athlete 1					Athlete 2								
Dive No.		Dive Code		Description			Position			Difficulty						
1		201B		Backward Dive			Pike			2.0						
E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score			
7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.0	7.0	52.40			
...table continued																
2	RUS		Athlete 1					Athlete 2								
...table continued																

Sub-table under each team shows detailed results for all dives

Medallists

Event Name
Date Time – Official

Video Stream

Medallists

Gold	China	Athlete 1
		Athlete 2
Silver	Russia	Athlete 1
		Athlete 2
Bronze	Great Britain	Athlete 1
		Athlete 2

Results

Start Order	Team															
1	CHN		Athlete 1					Athlete 2								
Dive No.		Dive Code		Description			Position			Difficulty						
1		201B		Backward Dive			Pike			2.0						
E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score			
7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.0	7.0	52.40			
...table continued																
2	RUS		Athlete 1					Athlete 2								
...table continued																

Live Predictions

The score prediction process will allow a user to predict the score for the dive taking place. Once the scores for the dive have been awarded, the user's prediction is compared to the average score awarded by the judges. Points are then awarded for the accuracy of the prediction. The user interface displays this action in these two stages:

1. When a new team becomes "current", an input asking for score prediction is displayed

Predictions

Input Your Score:

2. When the team receives their score, the score prediction area displays the points gained from the user's prediction.

Predictions

You score:	8.0
Judge's Average:	8.0
Points Gained:	10
Total:	150

Predictions

The predictions page allows users to see a history of the predictions they made and the points they gained in each event, as well as a leaderboard of the highest scoring users.

Predictions

Men's 3m

Total Points: 123

Team	Dive No.	Prediction	Actual	Points
RUS	1	7.5	8.0	5

Table Continued...

Men's 10m

Total Points: 123

Team	Dive No.	Prediction	Actual	Points
RUS	1	7.5	8.0	5

Table Continued...

Women's 3m

Total Points: 123

Team	Dive No.	Prediction	Actual	Points
RUS	1	7.5	8.0	5

Table Continued...

Women's 10m

Total Points: 123

Team	Dive No.	Prediction	Actual	Points
RUS	1	7.5	8.0	5

Table Continued...

Leaderboard

Rank	Username	Points
1	abcdef	123
2	abcdef	123
3	abcdef	123

Table Continued...

User Login

In the interim report it was specified that there will be a user login box in the header, however it was not specified what would be shown here once a user has been logged in. The design for this is below:

Logged In	
Username:	abcde
Rank:	5
Points:	123
Predictions	Logout

Link to logout and a second link to the predictions page so that it can be accessed quickly if the mouse is in this location from logging in

Bottom Navigation

A bottom navigation bar is a key element of any website or web application that was not scoped for in the basic design in the interim report. It is important to include a bottom navigation bar so that users have a secondary area they can use to navigate the site and to also act as a footer to help frame the main content of the page. Also, this is an ideal place to include any copyright information and is an area of a web page that a user will expect to find.

Copyright Text

Home-About-Diving Rules-Events-Predictions-Register

Graphical

Colour Scheme

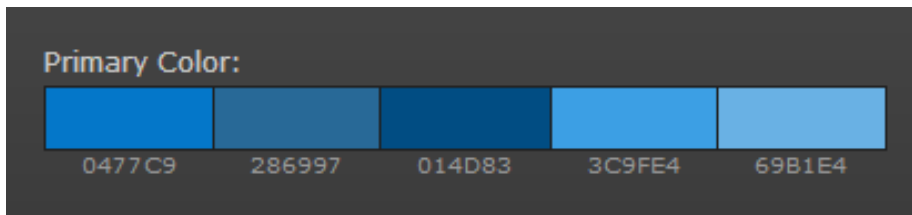
For the colour scheme there are a few design options that are most prevalent on the web. Here we have chosen to use a monochromatic colour scheme (variations of the same colour). This colour scheme gives the feeling of simplicity, elegance, and cleanliness which is a strong asset for a web application- particularly one like this where information consumption is one of its main functions. This calming effect will be beneficial for users who will be spending a lot of time on each page following the events from beginning to end. All monochromatic colours go well together, also making this scheme easy to manage. On the event pages we want the video stream to be one of the key eye-catching elements for the user, so using too many colours may distract attention from watching the video, thus monochromatic makes sense.

To choose which colour to start with for the monochromatic scheme, we can look at the schemes used at London 2012. The banner below (LOCOG, 2012) shows the colour scheme that was used for diving both online and in the dressing and presentation of the physical Aquatic's Centre.

Diving



As the blue is the dominant colour, this colour was then taken to create a colour scheme using <http://colorschemedesigner.com>, the results of which are below:



The application will use these five shades of blue throughout the user interface. For the main content areas we can use white as a background colour with black text. This is a standard and highly accessible colour scheme that will make information consumption easier and will also not detract the eye away from key viewing areas. We can also use grey as a secondary colour for any “softer” text or border lines such as the navigation bar, as this is still easily viewable on white but does not have as great an impact as black.

Font

When choosing a font for a website, it is important to use a web-safe font that will be compatible cross platform. For this application we are going to use Arial. Sans serif fonts like Arial are simple and straightforward and this simplicity makes it an easy-to-read font on computer monitors- a key element for a site aimed largely at information consumption. Arial is a very common font on the web which makes it familiar for users, and is also used for a clean look which fits well with the colour scheme.

Banner

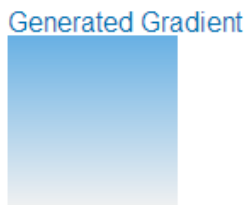
For the banner, it was decided to use blue on a white background to continue the same look and feel throughout the site, which should have the effect of making the banner seamlessly integrate with the rest of the page. As pictograms are regularly used to depict Olympic Sports in many forms of media, a diving pictogram in the public domain was located that is free to use (Parutakupiu, 2008). As the banner is an image, the font for the text does not need to be web-safe, so a freeware London Olympics font (Fonts2u, n.d.) is used. Looking at the existing London 2012 banner, the dates of the Olympics are also included, so these are added as sub-text.



Background

As is standard practice, we will be using a Cascading Style Sheet to style the web application. When creating a user interface it is important to cater for the wide variety of users with differing resolution monitors. This can be achieved with resolution dependent layouts- a single website with different CSS files for rearranging the content to take advantage of the screen size available. However, in this case it would be very time consuming to create several differing CSS files for each screen resolution, therefore, to still make the site highly compatible we can create a main content area, and then a background area which will span the remaining space. The most basic resolution that is usually supported by modern web applications is 1024X768, so the main content frame (including header and bottom navigation bar) will be made to this size, and this will be inside a background container

which spans 100% of the width. For this background area, we will need a background colour to separate it from the main content frame, so for this a gradient was created using <http://www.colorzilla.com/gradient-editor>, which is cross browser compatible. For the gradient, we again use blue from the monochromatic scheme, and then used a slightly off-white shade, as pure white creates a little too much impact and is the same colour used for the main content area.



Improvement

Now that the detailed user interface designs are complete, it is important to get user feedback on these designs to see if there are ways that they can be improved. To do this, the detailed layout designs were printed and used in a paper prototyping session with ten potential users. Paper prototyping was a good choice for this task as it is simple but can still provide a great deal of user feedback. In a project such as this one, where both time and resources are a large constraint, this is a big advantage as it means we can create and test the prototype quickly and without having to spend time programming or implementing anything. Doing this without any implementation also means that feedback can be incorporated to create improved designs easily, without having to make costly changes.

For the paper prototype session, all of the detailed results layouts were printed and users were allowed the chance to navigate around the site freely. When they were happy that all feedback had been given, they were guided through the process of an event, switching the pages to simulate the automatic refresh as the event progresses.

From these sessions, the following feedback was received:

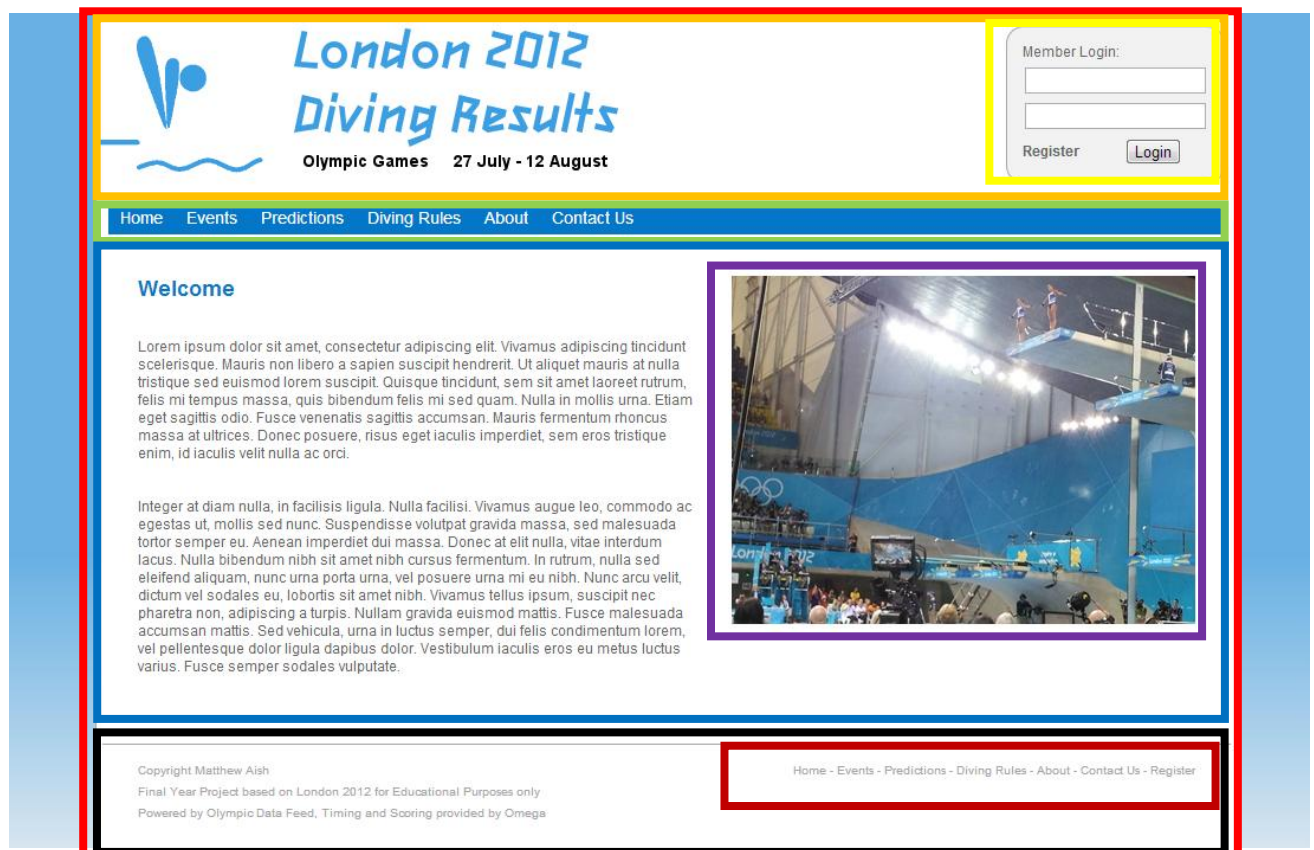
- There is a drop down list for the “Events” link in the navigation bar, but simply clicking on events does nothing. This should take the user to a page displaying the list of events, similarly to the drop down list.
- There is nowhere on the site where a user can contact the owner of the website. There should be a page with a “contact us” form.
- The video stream is not in a great position as it seems to be in the middle of the results content. It would be better if this were to the side of the content if space permits.
- Having both the “current” and “previous” teams displayed at the same time is confusing and clutters the page. It may be better to simply show the “current” team when the team is about to dive, then show the “previous” team when scores are in, then just the “current” team when the next team is about to dive.
- The sub-tables in results and predictions make the tables cluttered and difficult to read. It would be better to have these hidden and then have a way to show them on user request.
- The order of the links in the navigation bar should change to be in order of the most commonly visited pages (Home, Events, Predictions etc. With the same order for the bottom navigation bar)

This user feedback is agreeable and there is no reason why all of the above points cannot be implemented, so they have now incorporated into the design.

Static Implementation

A static version of the web application will now be implemented to check that the design is entirely feasible, and then can be adapted during the bulk of implementation to include the dynamic content.

The pages are structured using DIV tags which are then styled and positioned using a cascading style sheet. The screenshot below shows the structure of these DIVs:



Page Container

The page container div encompasses the content of the page. To make sure it fits on a 1024 x 768 monitor its width is slightly under 1024 pixels. We also apply a border to frame the container from the background. To apply the gradient background behind we apply a background image to the HTML tag and make sure it is 100% width. The font style is added to the body tag so that it applies to all textual content.

Header

The header DIV simply sets the banner as its background image and fixes the size to the appropriate height. Inside this DIV is the login box, another DIV which floats to the right of the header. It has a curved border and a grey background to make it stand out against the header but not with too great an impact.

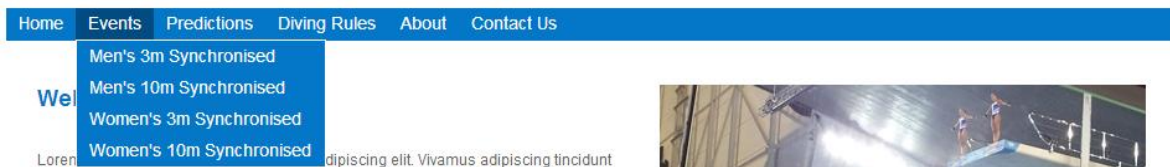
Member Login:

Register Login

Logged In
User: Xb2305kw
Rank: 5
Points: 132
[Predictions](#) [Log Out](#)

Navbar

The navigation bar is a DIV containing an unnumbered list that is styled horizontally. On rollover the background changes, and when hovering over Events, a second list is shown with links to each event page.



Content

The content DIV comes after the navigation bar and is the main content area for the web application. Inside the content DIV is the side image DIV which floats to the right. This is used to show images if required and to hold the video stream on event pages.

Footer

The footer DIV comes below the content area and contains the copyright text. The altnav DIV is contained inside of this and floats to the right and contains the secondary navigation links.


Events

I added the events page that was given in the user feedback. This provides the same navigation as the drop down list with colour change on hover.



Start List

The start list now includes show/hide buttons for each team to view their dive list.



London 2012 Diving Results

Olympic Games 27 July - 12 August

Member Login:

Register


Home Events Predictions Diving Rules About Contact Us

Men's Synchronised 3m Platform

1st August 2012 15:00 - Scheduled

Start List

Start Order	Team																																	
1	China	Lin Yue	Qin Kai	-																														
<table> <thead> <tr> <th>Dive No.</th> <th>Dive Code</th> <th>Dive Description</th> <th>Position</th> <th>Difficulty</th> </tr> </thead> <tbody> <tr><td>1</td><td>201B</td><td>Backward Dive</td><td>Pike</td><td>2.0</td></tr> <tr><td>2</td><td>201B</td><td>Backward Dive</td><td>Pike</td><td>2.0</td></tr> <tr><td>3</td><td>201B</td><td>Backward Dive</td><td>Pike</td><td>2.0</td></tr> <tr><td>4</td><td>201B</td><td>Backward Dive</td><td>Pike</td><td>2.0</td></tr> <tr><td>5</td><td>201B</td><td>Backward Dive</td><td>Pike</td><td>2.0</td></tr> </tbody> </table>					Dive No.	Dive Code	Dive Description	Position	Difficulty	1	201B	Backward Dive	Pike	2.0	2	201B	Backward Dive	Pike	2.0	3	201B	Backward Dive	Pike	2.0	4	201B	Backward Dive	Pike	2.0	5	201B	Backward Dive	Pike	2.0
Dive No.	Dive Code	Dive Description	Position	Difficulty																														
1	201B	Backward Dive	Pike	2.0																														
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4	201B	Backward Dive	Pike	2.0																														
5	201B	Backward Dive	Pike	2.0																														
2	Russia	Ilya Zakharov	Evgeny Kuznetsov	+																														
3	China	Lin Yue	Qin Kai	+																														
4	China	Lin Yue	Qin Kai	+																														
5	China	Lin Yue	Qin Kai	+																														
6	China	Lin Yue	Qin Kai	+																														
7	China	Lin Yue	Qin Kai	+																														
8	China	Lin Yue	Qin Kai	+																														



Current

When a team becomes current, we now only display the current team's details, ask for a prediction, and include the results table at the bottom.

Men's Synchronised 3m Platform

1st August 2012 15:00 - Running

Current Team


Rank	Team		Total
2	Canada	A. Despatie R. Reuben	45.70

Dive No.	Dive Code	Dive Description	Position	Difficulty
2	201B	Backward Dive	Pike	2.0

Prediction
Input Your Score:

Standings

Rank	Team			Total																																							
1	China	Lin Yue	Qin Kai	98.40	-																																						
<table> <thead> <tr> <th>Dive No.</th> <th>Dive Code</th> <th>Dive Description</th> <th>Position</th> <th>Difficulty</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>201B</td> <td>Backward Dive</td> <td>Pike</td> <td>2.0</td> </tr> </tbody> </table> <table> <thead> <tr> <th>E1</th> <th>E2</th> <th>E3</th> <th>E4</th> <th>E5</th> <th>E6</th> <th>S1</th> <th>S2</th> <th>S3</th> <th>S4</th> <th>S5</th> <th>Pen</th> <th>Avg</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>8.0</td> <td>8.0</td> <td>8.5</td> <td>8.5</td> <td>8.5</td> <td>8.0</td> <td>7.5</td> <td>8.0</td> <td>8.0</td> <td>8.5</td> <td>8.0</td> <td>0.0</td> <td>8.7</td> <td>52.00</td> </tr> </tbody> </table>						Dive No.	Dive Code	Dive Description	Position	Difficulty	2	201B	Backward Dive	Pike	2.0	E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score	8.0	8.0	8.5	8.5	8.5	8.0	7.5	8.0	8.0	8.5	8.0	0.0	8.7	52.00
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4	China	Lin Yue	Qin Kai	98.40	+																																						



Previous

When the team receives a score, the scores are displayed along with the results of the prediction and results table at the bottom.

Men's Synchronised 3m Platform

1st August 2012 15:00 - Running

Previous Team

Rank	Team		Total
2	United States	T. Dumais K. Ipsen	44.20

Dive No.	Dive Code	Dive Description	Position	Difficulty
2	201B	Backward Dive	Pike	2.0

E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score
8.0	8.0	8.5	8.5	8.5	8.0	7.5	8.0	8.0	8.5	8.0	0.0	8.2	49.80

Prediction
You scored: 8.5
Average Judge's score: 9.0
+10 points!
Total: 25

Standings

Rank	Team		Total	+																																						
1	China	Lin Yue Qin Kai	98.40	-																																						
<table border="1"> <thead> <tr> <th>Dive No.</th> <th>Dive Code</th> <th>Dive Description</th> <th>Position</th> <th>Difficulty</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>201B</td> <td>Backward Dive</td> <td>Pike</td> <td>2.0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>E1</th> <th>E2</th> <th>E3</th> <th>E4</th> <th>E5</th> <th>E6</th> <th>S1</th> <th>S2</th> <th>S3</th> <th>S4</th> <th>S5</th> <th>Pen</th> <th>Avg</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>8.0</td> <td>8.0</td> <td>8.5</td> <td>8.5</td> <td>8.5</td> <td>8.0</td> <td>7.5</td> <td>8.0</td> <td>8.0</td> <td>8.5</td> <td>8.0</td> <td>0.0</td> <td>8.7</td> <td>52.00</td> </tr> </tbody> </table>					Dive No.	Dive Code	Dive Description	Position	Difficulty	2	201B	Backward Dive	Pike	2.0	E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score	8.0	8.0	8.5	8.5	8.5	8.0	7.5	8.0	8.0	8.5	8.0	0.0	8.7	52.00
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2	Russia	Ilya Zakharov Evgeny Kuznetsov	98.40	+																																						

Unofficial / Official

When unofficial or official, the results table is shown. When the Medallists are sent these are added to the top of the page.

Men's Synchronised 3m Platform

1st August 2012 15:00 - Official

Medallists

Gold	Great Britain	Tom Daley Peter Waterfield
Silver	China	Qui Bo Lin Yue
Bronze	United States	Troy Dumais Kristian Ipsen

Results

Rank	Team		Total	+
1	China	Lin Yue Qin Kai	98.40	-
2	Russia	Ilya Zakharov Evgeny Kuznetsov	98.40	-
3	China	Lin Yue Qin Kai	98.40	+
4	China	Lin Yue Qin Kai	98.40	+
5	China	Lin Yue Qin Kai	98.40	+
6	China	Lin Yue Qin Kai	98.40	+
7	China	Lin Yue Qin Kai	98.40	+
8	China	Lin Yue Qin Kai	98.40	+

Predictions

The predictions page now has show/hide buttons to view a history of predictions for each event.

Your Predictions:

Expand an event to see your record

Men's 3m Synchronised					-
Team	Dive No.	Prediction	Actual	Points	
RUS	1	7.5	8.0	5	
RUS	2	7.5	7.5	20	

Men's 10m Synchronised					+
Women's 3m Synchronised					+
Women's 10m Synchronised					+

Leaderboard

Rank	Username	Total Points
1	Abcde123	532
2	Abcde123	532
3	Abcde123	532
4	Abcde123	532
5	Abcde123	532
6	Abcde123	532
7	Abcde123	532
8	Abcde123	532
9	Abcde123	532
10	Abcde123	532
124	You	532

Register

To allow the registration form to stand out against the content area, it uses a similar styling to the login DIV with a grey background and rounded corners.

Register

Complete the form below to register, allowing you to play the prediction game during events!

Username
Your desired username

Email
Add a valid email address

Confirm Email
Confirm your email address

Password
Min. size 6 chars

Confirm Password
Confirm your password

Register

Contact

The contact form also uses the same styling as the register and login forms.

Contact Us

Complete the form below to contact us with any queries

Name
Your full name

Email
Your email address

Message
Your message

Submit

As shown in the screenshots above, a static version of the user interface has been successfully implemented, thus showing that the design can be achieved in the browser. Much more time could now be spent testing and improving this user interface design, however, with time being such a huge constraint on this project, it is best to leave the designs complete here and begin implementing the dynamic content of the web application. It is still important to note that these designs are not final, and any problems encountered or changes made during implementation could result in the user interface being adapted. It is also still key to evaluate the user interface, hence a detailed evaluation and user testing have been scoped once implementation is complete to identify any improvements that can be made.

Full code listings of the static pages are available in Appendix C.

Web Application Implementation

Project Plan Revision

With the design process now complete, it is important to again review my project plan. Originally it was difficult to plan the implementation of the web application as no detailed designs had been made, so I simply planned iterations of the application. However, now that I have completed designs and have planned the content of each page, I am able to create a much more specific and detailed plan to implement the various application components. Thus, I have split the implementation into the following tasks:

- Login and Logout
- User Registration
- Contact Form
- Video Stream
- Start List
- “Current” Results Screen
- “Previous” Results Screen
- Automatic Refresh
- Medallists and Final Results

I now have a much more detailed plan going forward which should help me keep on track for the implementation of the web application. At this point it is also worth noting that I am much further ahead of schedule than I planned to be, largely because completing the message processing, database, and detailed designs did not take as long as planned. I have updated this on the project plan which results in a lot more time to complete implementation than was originally planned which will be beneficial if any problems are encountered.

Please see Appendix D for the revised project plan.

Core Functionality

The core functionality of the application includes user registration, logging in and out, contact form etc. These are implemented and operate in standard ways used on many web applications so are not

integral to the development of the main components of the application. For full details of the implementation of this functionality please see Appendix E.

Results

HTML5 Video

In the interim report using plugins like JW Player to allow playback of video on the web application was discussed. However, on further investigation a simpler solution has been found. Plug-ins or scripts are often used for video online as there was previously no standard for this; however, HTML5 introduced the video tag which is supported by the major browsers: Internet Explorer 9+, Firefox, Opera, Chrome, and Safari. However, there is still a slight issue with this- although all of these browsers accept the video tag, they each support different source file formats.

Currently, there are 3 supported video formats for the <video> element: MP4, WebM, and Ogg. If this were a full scale implementation, then we would convert and save video of each event into all three formats, however due to time and storage limitations we will simply convert to MP4 and webM so there is at least one supported format for each browser. The video is simply the live footage of each event at the Olympic Games that was broadcast with commentary and TV Graphics, so this can be played and the event will progress to simulate it as if it were live. These videos were uploaded to YouTube by the International Olympic Committee and are referenced in the bibliography.

```
<div id="side-image">
    <video width="400" height="224" poster="images/video-image.png">
        <source src="videos/W3msync.webm" type="video/webm">
        <source src="videos/W3msync.mp4" type="video/mp4">
    </video>
</div>
```

Results Page Basics

Each event has its own page, and on this page another DIV needs to be added so that the content area is made up of two unique DIV tags. This is because when the automatic refresh is implemented, we need to only refresh the part of the page with the results. If we refresh the whole of the content DIV, then the embedded video will also be refreshed interrupting playback. The aim is to have the results updating as the video stream continues, so the results need to be contained in this separate DIV. Inside the new DIV, we simply “include” the PHP file that will display the results content.

```
<div id="content">
    <div id="side-image">
        //video code
    </div>
    <div id="dynamic">
        <?php include('results/W201content.php'); ?>
    </div>
</div>
```

The event content page first makes a connection to the database and then gets the schedule status of the event in question along with the date and start time.

```
SELECT status, date, start_time FROM events WHERE code = 'DVW201101'
```


The date and start time and processed into a more understandable format i.e. from “2012-07-29 15:00:00” to “July 31 2012 15:00”. This is then printed to screen.

```
echo "<h2>Women's Synchronised 3m Springboard</h2>";
echo ("<h3>".(strftime("%B %d %Y %H:%M",$datetime))." - ");
```

The behaviour of the page now depends on the schedule status and is controlled by if statements. If scheduled we show the start list, if in progress we show the live status, if unofficial or official we show final results. The current status is also output to screen next to the date and start time.

```
if(($statusrow['status']) == "2"){
    echo "Scheduled</h3>";
```

Start List

To display the start list, we first perform a query that selects competitors from the event in question. If this query returns zero rows, then we know that there are no competitors for the event in the database, hence no start list has been sent yet, so we display an error message. Otherwise, we perform a second query to select the detailed information for each team- the start order, team name, athlete names etc.

We then construct the start list table, adding a toggle cell to the header. Then for each row of the query, we add the team data to the table. Each team then has a hidden row, where we perform a query to retrieve that team’s dive information and create the sub-table containing the dive list.

```
$sqlquery = SELECT competitor FROM results WHERE competitor LIKE 'DVW201%'
If (num_rows($sqlquery) == 0)
    No start list available at this time
End If
Else
    SELECT r.start_order, t.name, t.code as teamcode, a1.family_name as alfname,
    a2.family_name as a2fname, a1.given_name as alfname, a2.given_name as a2gname
    FROM teams t, athletes a1, athletes a2, results r
    WHERE t.athlete1 = a1.code
    AND t.athlete2 = a2.code
    AND r.competitor = t.code
    AND r.event = 'DVW201101'
    ORDER BY r.start_order ASC

    //table header with toggle
    For each row of query (each team)
        //competitor info to table
        //hidden row containing dive table
        SELECT dive_number, dive_code, description, difficulty
        FROM dives
        WHERE competitor = '". $sqlrow['teamcode']. "'
        For each row (each dive)
            //dive info to dive table
        End For
    End For
End Else
```

Live Content

When the event is in progress, we first perform a query to get all of the results information for the current competitor. If there is a current athlete, then we need to get the current round number. This is because in the first round, there will be no current ranking or scores for each team, so we need to

adjust the table to not include any of this information. So if the round is the first round, we construct a table without rank and score, and if it is any other round we construct the full table. Before displaying the rank in the table, we need to check the RankEqual field, and if this is 'Y' then we append an "=" to the rank to show it is equal. We then use the round number to perform a query to get information for the dive the team is about to perform, and create the table to display this information. The dive position is displayed, however, this is not intrinsically stored in the database, so to get this information we use the function below to take the last symbol of the dive code (this represents the position) and return the corresponding position in text form.

```
function divePos($code){
    $position = strrev($code);
    $position = $position{0};
    if ($position === "A"){
        $position = "Straight";
    }
    else if ($position === "B"){
        $position = "Pike";
    }
    else if ($position === "C"){
        $position = "Tuck";
    }
    else{
        $position = "Free";
    }
    return $position;
}
```

If the query for the current team returns zero rows then we know there is no current team, so instead we go to check if there is a team marked previous. We perform a similar query to get the results data for the previous team, however, we still need to check that a row is returned because there is the case at the beginning of an event where there is no current or previous team. If there is a previous team then we check for equal rank and build the table. We then check the round number so that we can get the correct dive information and build the two tables- the first to show the dive information and the second to show the scores for the dive.

After the current and previous information, we show the full live standings table. We perform a query to get the results information for each team and then loop through each record. If the team has a rank, then we add them to the table- we do not want to show unranked teams in the standings table. We add the team's data to the table, then create a hidden row where we query the results for each dive that has been scored, and add these records to a sub-table in the hidden row.

```
//get current competitor
$currentquery = mysql_query(" SELECT r.rank, r.equal_rank, r.total, t.name, t.code as
                             teamcode, a1.family_name as alfname, a2.family_name as a2fname,
                             a1.given_name as alname, a2.given_name as a2gname
                             FROM results r, teams t, athletes a1, athletes a2
                             WHERE r.current = 'X'
                             AND t.athlete1 = a1.code
                             AND t.athlete2 = a2.code
                             AND r.competitor = t.code
                             AND r.event = 'DVW201101'")

If (num_rows($currentquery) == 0)
```

```

$previousquery = mysql_query("      SELECT r.rank, r.equal_rank, r.total, t.name,
                                t.code as teamcode, a1.family_name as alfname,
                                a2.family_name as a2fname, a1.given_name as
                                alname, a2.given_name as a2gname
                                FROM results r, teams t, athletes a1, athletes a2
                                WHERE r.previous = 'X'
                                AND t.athlete1 = a1.code
                                AND t.athlete2 = a2.code
                                AND r.competitor = t.code
                                AND r.event = 'DVW201101'")

If (mysql_num_rows($previousquery) != 0)
    If rank equal Y, append = to rank
    //build previous table
    $roundquery = mysql_query("      SELECT round FROM events WHERE code='DVW201101'")
    $previousdivequery = mysql_query("      SELECT dive_number, dive_code, description, difficulty, E1, E2, E3, E4,
                                E5,E6, S1, S2, S3, S4, S5, pen, avg, score
                                FROM dives
                                WHERE competitor = ".$previousrow['teamcode'].
                                AND dive_number = ".$round)
    //divepos function
    //build dive info table

    //Input predictions code here
End If
End If
Else
    $roundquery = mysql_query("      SELECT round FROM events WHERE code='DVW201101'")
    if($round == 1)
        //build current table without ranks
    End If
    else
        If rank equal Y, append = to rank
        //build current table
    End Else
    $currentdivequery = mysql_query("      SELECT dive_number, dive_code, description, difficulty
                                FROM dives
                                WHERE competitor = ".$currentrow['teamcode'].
                                AND dive_number = ".$round)
    //divepos function
    //build dive info table

    //Predictions results here
End Else
$resultsquery = mysql_query("      SELECT r.rank, r.equal_rank, r.total, t.name, t.code as
                                teamcode, a1.family_name as alfname, a2.family_name as a2fname,
                                a1.given_name as alname, a2.given_name as a2gname
                                FROM results r, teams t, athletes a1, athletes a2
                                WHERE t.athlete1 = a1.code
                                AND t.athlete2 = a2.code
                                AND r.competitor = t.code
                                AND r.event = 'DVW201101'
                                ORDER BY r.sort_order ASC ")

//create results table with toggle
For each team
    If (!is_null($resultsrow['rank']))
    If rank equal Y, append = to rank
    //add team results to table
        $divequery = mysql_query("      SELECT dive_number, dive_code, description, difficulty, E1, E2, E3, E4,
                                E5, E6, S1, S2, S3, S4, S5, pen, avg, score
                                FROM dives
                                WHERE competitor = ".$resultsrow['teamcode'].
                                AND score IS NOT NULL
                                ORDER BY dive_number ASC")

```

```


        //create hidden row and dive table
        //divepos function
        //add dives to table
        End If
    End If
End For

```

AJAX refresh

The live results page now displays the correct content, however, when a change is made in the database- team receives scores, next team becomes current etc.- this is only seen on the page after a full refresh. With AJAX we can retrieve the new data and update the DIV tag containing the results asynchronously (in the background). This is achieved using the XMLHttpRequest object and means that it is possible to update part of the web page, without reloading the whole of it or interfering with the display and behaviour of the rest of the page.

We need to be able to control when the page is updated. The processing of an ODF message can contain multiple updates to records and multiple queries, so we need to make sure that the page is not updated in the middle of this transaction like operation, as this could cause erroneous data to be shown. So we need to record when processing of a message is complete, and then update the page when this record is updated. To do this, I have implemented the following table, updates, in the database.



	java	php
	0	0
	0	0

So when processing of a message is complete we add one to the “java” field. As there is now a difference between the java and php records we know to update the web page using AJAX. When this is complete we then add one to the php record to indicate that the update is complete.

In the OdfProcessor, I have a method, updateDBStatus, that gets the value of “java”, adds one and updates it in the database. This method is called after processing of each of the following messages is complete:

- DT_SCHEDULE_UPDATE
- DT_START_LIST
- DT_RT_RESULT
- DT_MEDALLISTS

The update needs to be called after these messages as these directly change fields that occur on the results page.

```

public void updateDBStatus() {
    String query = "SELECT java FROM updates";
    try{
        ResultSet rs = st.executeQuery(query);
        int updateNo =0;
        // iterate through the java resultset
        while (rs.next()){
            updateNo = rs.getInt("java");
        }
    }
}

```

```

        updateNo= updateNo +1;
        sql = ("UPDATE updates SET java="+updateNo);
        //execute query
        st.executeUpdate(sql);
    }
    catch (Exception e){
        e.printStackTrace();
    }
}

```

On the event page, a JavaScript function called `ajaxCheckDB` runs a PHP script on the server to check if an update is needed on the page. This uses AJAX, so in the background a `XMLHttpRequest` object is created. The request runs the `checkUpdateStatus.php` script via GET request. The `readystatechange` object stores the status of the `XMLHttpRequest`, and the `onreadystatechange` property is used to store the function that is called automatically each time the `readystatechange` changes. When the `readystatechange` is four (the request to server is finished and response is ready) then we get the response from the PHP script. If the response is yes then the function to actually refresh the content is called.

```

function ajaxCheckDB(){
    var ajaxRequest;
    ajaxRequest = new XMLHttpRequest();
    //browser support code

    ajaxRequest.onreadystatechange = function(){
        if(ajaxRequest.readyState == 4){
            var string = ajaxRequest.responseText;
            if(string == "yes"){
                ajaxRefreshContent();
            }
        }
    }
    ajaxRequest.open("GET", "checkUpdateStatus.php", true);
    ajaxRequest.send(null);
}

```

The `checkupdatestatus` script simply connects to the database gets the java and php values from the updates table. If java has a greater value than php, we know an update is needed, so we return “yes” (which allows the `ajaxCheckDB` function to call `ajaxRefreshContent`), and then update the php field in the database to match the java field. Otherwise we simply return “no” as no update is needed. The connection to the database is then closed.

```

//connection to database
SELECT java, php FROM updates
    If (java > php)
        echo "yes";
        UPDATE updates SET php = java
    }
    else{
        echo "no";
    }
}

```

```
//close connection
```

When `ajaxRefreshContent` is called, the `xmlHttpRequest` object opens the PHP content page for the event in the background. When ready, the script then changes the inner HTML of the dynamic DIV tag to be the updated version of the results content. And thus, the page has now been updated.

```
function ajaxRefreshContent() {
    var xmlHttp;
    xmlHttp=new XMLHttpRequest
    //browser support code

    xmlHttp.onreadystatechange=function() {
        if(xmlHttp.readyState==4) {

            document.getElementById('dynamic').innerHTML=xmlHttp.responseText;
        }
    }
    xmlHttp.open("GET","results/W201content.php",true);
    xmlHttp.send(null);
}
```

Now that we can update the content of the page, we need a way to call the `ajaxCheckDB` function. This is achieved using a simple JavaScript timer function. The function is called as soon as the window is loaded. This calls the `ajaxCheckDB` function, and then `setTimeout` is used to call the function again 3 seconds later. I decided to set the interval to 3 seconds so that requests to the database are not too frequent, but updates can occur at a maximum of 3 seconds later than they are completed in the database which I feel is an acceptable time. If this did still prove too intense on the database then the time can always be changed easily.

```
function mytimer() {
    ajaxCheckDB();
    setTimeout(mytimer,3000);
}
window.onload = mytimer;
```

Medallists

When the schedule status is official, the information regarding medallists may be available, so we perform a query to get the information on the medallists. If this returns any rows, we know the medals have been assigned so we loop through each record adding the details of the medallists to the table. If no rows are returned we do nothing. After the medals table, we continue to show the full standings table.

```
SELECT r.medal, t.name, t.code as teamcode, a1.family_name as alfname,
a2.family_name as a2fname, a1.given_name as alname, a2.given_name as
a2gname
FROM results r, teams t, athletes a1, athletes a2
WHERE t.athlete1 = a1.code
AND t.athlete2 = a2.code
AND r.competitor = t.code
AND r.event = 'DVW201101'
AND medal IN('GOLD','SILVER','BRONZE')
```

```
ORDER BY r.sort_order ASC ")

If (num_rows!= 0){
    For each row
        //add medallists to table
    End For
End If
```

Score Prediction

Points

For a user to gain points, they must provide an accurate prediction which is compared with the average judge's score. The points system below has been devised so that the application suitably rewards those with the most accurate scores, but also allows those who are not so accurate to continue to earn points and not feel alienated from the game. Although the actual scores from the judge's are only in steps of 0.5, the average score may not be, so we need to scope for the possibility that the user is only 0.1 or 0.2 points out on their prediction.

Difference in Score	Points
0	20
0.1	18
0.2	16
0.3	14
0.5	10
1.0	5
1.5	2

The predictions table below is used to store user predictions in the database. The username, competitor code and dive number make up the primary key. We store the score given by the user and the points gained from that prediction.

#	Name	Type	Collation	Attributes	Null	Default
<input type="checkbox"/> 1	<u>username</u>	varchar(25)	latin1_swedish_ci		No	None
<input type="checkbox"/> 2	<u>competitor</u>	varchar(11)	latin1_swedish_ci		No	None
<input type="checkbox"/> 3	<u>number</u>	int(11)			No	None
<input type="checkbox"/> 4	score	char(4)	latin1_swedish_ci		No	None
<input type="checkbox"/> 5	points	int(11)			No	0

Input

Input of a prediction occurs when a new team becomes current. If the user is logged in then they are presented with a form to submit their score, or otherwise a prompt to login. Although the form has only one visible input, there are also three hidden input fields which store the values of the current competitor, the dive number, and the username of the logged in user. These are included in the form so that they can be sent to the script that processes the form.

```
if ($_SESSION['username']){
?>
<div id="score-prediction">
```

```

<form action="" method="post" name="predform"
onsubmit="formProcess('results/predictionprocess.php', 'score-prediction'); return false;">
    <label>Input Your Score (Must be in format x.x and between 0.0 and 10.0):</label>
    <input id="myscore" type="text" name="myscore" size="4" />
    <input id="competitor" type="hidden" name="competitor" value="<?php echo $teamcode;
?>">
    <input id="diveno" type="hidden" name="diveno" value="<?php echo $round; ?>">
    <input id="username" type="hidden" name="username" value="<?php echo
$_SESSION['username']; ?>">
    <button type="submit" name="submit" value="submit">Submit</button>
</form>
</div>
<?php
}
else{
    echo"    <div id=\"score-prediction\">
                <h4>Please login to predict scores</h4>
            </div>";
}

```

The form needs to be processed by PHP so that we can check and insert the data similarly to the forms used already in this application. However, because this form is part of the live event page, we need this processing to be carried out in the background so that it doesn't interrupt or alter the behaviour of the results page. To do this, we use AJAX again.

When the form is submitted, the formProcess function is called. This creates a XMLHttpRequest object as is needed for background processing. The form values are then collected and are store as a string of POST data that we can then send to the PHP script- predictionprocess.php. The AJAX request is set, we add a header to tell the PHP script to recognize the POST data and then send the request. When the request is complete the results of the PHP script are returned to the score-prediction DIV that holds the original form.

```

function formProcess/php_file, tagID){
    var request = get_XmlHttp();
    var myscore = document.getElementById('myscore').value;
    var competitor = document.getElementById('competitor').value;
    var diveno = document.getElementById('diveno').value;
    var username = document.getElementById('username').value;
    var post_data =
'myscore='+myscore+'&competitor='+competitor+'&diveno='+diveno+'&username='
+username;
    request.open("POST", php_file, true);

    request.setRequestHeader("Content-type", "application/x-www-form-
urlencoded");
    request.send(post_data);

    request.onreadystatechange = function() {
        if (request.readyState == 4) {
            document.getElementById(tagID).innerHTML = request.responseText;
        }
    }
}

```


The PHP script gets the POST data from the form. If score is null then we know the form was submitted without a score being entered, so we show the error and display the form again so the user can predict again. If the score matches the correct format, then we can insert the data into the database and output that the prediction was made. If it does not match, we know the score was entered in the wrong format, so output the error and the form so that the user can predict again.

```
//get POST data
if (strlen($score)==0){
    echo "<h4>Please enter a score</h4>";
    //show prediction form
}
else if(preg_match('/^([0-9]\.[0-9])|(10.0)$/',$score)){
    //connect to DB
    INSERT INTO predictions (username, competitor, number, score)
    VALUES ('".$username."', '".$competitor."', ".$diveno.", ".$score.
    echo "You scored the dive ".$score;
    //close connection
}
Else{
    echo '<h4>Score is in the incorrect format</h4>';
    //show prediction form
}
```

Results

When a team receives scores (becomes previous) then we display the results of the user prediction. If the user is not logged in then a prompt to log in is displayed. If the user is logged in, then we first we perform a query to get the prediction for the team and dive made by the user. If this query returns zero rows, then we know that no prediction was made and print this message. Otherwise we calculate the difference between the prediction and the judge's average and set the points variable accordingly. The points gained value in the database is then updated.

The user's total now needs to be updated. We perform a query to get the total, and add the points gained to get the new total. We could simply update the total in the database at this point, however, this would mean that refreshing the page would allow a user to keep adding points to their total. To solve this problem we add a new field to the predictions table called added. This value is null by default so we can then change it to X when the points have been added to the total. So if added is null, we update the total in the database and then update the added field. The points gained and updated total are then printed to screen.

```
if ($_SESSION['username']){
    $predquery = ("    SELECT score, added FROM predictions
                    WHERE username = '".$_SESSION['username']."'
                    AND competitor = '".$_teamcode."'
                    AND number = ".$round)

    if (mysql_num_rows($predquery) == 0){
        echo "No score prediction was made"
    }
    else{
        $difference = abs($predrow['score'] - $predavg);
        if($difference == 0){
```

```

        $points = 20;
    }
    else if($difference <= 0.1){
        $points = 18;
    }
    else if($difference <= 0.2){
        $points = 16;
    }
    else if($difference <= 0.3){
        $points = 14;
    }
    else if($difference <= 0.5){
        $points = 10;
    }
    else if($difference <= 1){
        $points = 5;
    }
    else if($difference <= 1.5){
        $points = 2;
    }
    else{
        $points = 0;
    }

    mysql_query("UPDATE predictions SET points=".$points."
                WHERE username = '".$_SESSION['username']."'
                AND competitor = '". $teamcode."'
                AND number = ".$round)

    $gettotalquery = ("SELECT total FROM users
                        WHERE username = '".$_SESSION['username']."'")
    while($gettotalrow = mysql_fetch_array($gettotalquery)){
        $total = $gettotalrow['total'];
        if(is_null($predrow['added'])){
            $total = $total + $points;
            UPDATE users SET total=".$total."
            WHERE username = '".$_SESSION['username']."'

            UPDATE predictions SET added='X'
            WHERE username = '".$_SESSION['username']."'
            AND competitor = '". $teamcode."'
            AND number = ".$round)
        }
    }

    echo  You scored: ".$predrow['score']." <br />
        Average Judge's score: ".$predavg." <br />
        You gained: ".$points." points! <br />
        Your Games total is now: ".$total." points!
    }
else{
    echo "Please login to predict scores"
}

```

```
}
```

History and Leader Board

The predictions page shows a history of predictions made by a user and a leader board of the top 10 users. If a user is not logged in, we display a prompt for them to do so, otherwise we perform a query to get the list of events that are not scheduled i.e. have been completed or are in progress. If this returns zero rows then we know no events have taken place yet, so display this, otherwise we continue and build the tables.

To build the leader board we select the users and their totals in order, and then loop through the results adding each row to the table until we have ten rows. We then move to building the predictions tables. We loop through results of the earlier query where we got the non-scheduled events and get a substring of the event code for use in our later queries, and also get the textual name of the event. We are now able to perform a query to get the total points the user gained for each event. So we build the predictions table and for each event print the total, or if the total is null we output that no predictions were made. We now perform a query to get information about each prediction made for the event and then build a sub-table containing the prediction history.

```
if ($_SESSION['username'])
    //connect to DB
    SELECT code FROM events WHERE status != 2")
    If (num_rows == 0)
        echo "No events have taken place yet;
    End If
    Else
        //Leaderboard
        SELECT username, total FROM users ORDER BY total DESC, username
        //build table
        For each row && counter < 10
            add row to table
            counter++
        End For

        For each row of event query
            $event = substr($eventrow['code'],0,6);
            if($event == 'DVM201'){
                $eventstr = "Men's 3m Synchronised";
            }else if($event == 'DVM202'){
                $eventstr = "Men's 10m Synchronised";
            }else if($event == 'DVW201'){
                $eventstr = "Women's 3m Synchronised";
            }else{
                $eventstr = "Women's 10m Synchronised";

            SELECT SUM( points ) AS total
            FROM predictions
            WHERE username = '". $_SESSION['username'] ."'
            AND competitor LIKE '". $event ."%'"

            For each event returned
                If(is_null($totalrow['total']))
```

```

        //build table, no predictions made for event
    End If
    Else
        //build table, total points for event
        SELECT t.name, p.number, p.score, p.points, d.avg
        FROM predictions p, dives d, teams t
        WHERE p.competitor = d.competitor
        AND p.number = d.dive_number
        AND p.competitor = t.code
        AND p.username = '".$_SESSION['username']."'
        AND p.competitor LIKE '". $event. "%'"
        For each record
            //add prediction info to subtable
        End For
    End Else
End For
End For
End Else
End If
Else
    echo "Please login to see your prediction history";
End Else

```

To implement the show/hide functionality for the sub-table, each event has a toggle function. The row in question is set to have no display and given the id “hidden”. The toggle function gets this hidden row, and if it has no display style it then removes this property so it becomes visible. Otherwise it reverts the display to none so that it is hidden again. A span with id “toggler” is used to control this- on click it calls the toggle function. The toggle function also sets the span to be “-” when the row is visible and “+” when it is hidden.

```

<tr><th>". $eventstr."</th><th><span id=\"toggler\". $event.\"\"
onClick=\"toggle\". $event.\"();\">+</span></th></tr>
<tr id=\"hidden\". $event.\"\" style=\"display:none;\"><td>
    //sub table here
</td></tr>

function toggleDVW201() {
    var element = document.getElementById("hiddenDVW201");
    if( element.style.display=='none' ){
        element.style.display = '';
        document.getElementById("togglerDVW201").innerHTML='-';
    }
    else{
        element.style.display = 'none';
        document.getElementById("togglerDVW201").innerHTML='+';
    }
}

```

Static Content

The remaining static pages without any dynamic content are not of great importance in the overall project. As this web application is a prototype that demonstrates the ideas behind this project, it would not make sense to waste great amounts of time focusing on writing trivial content that could

easily be changed and altered in a real world application. These pages have been filled with some content in the following ways:

- The index page simply features an image and some lorem ipsum to show textual content that would most likely be present on any home page.
- The diving rules page includes a summary of the rules of Olympic Diving from <http://diving.about.com/od/olympics/a/OlyDivRules.htm>. Any real web site would likely include greater detail, diagrams and videos to explain the sport.
- The about page again shows lorem ipsum and a table of the points award system for predictions. The full version would have more detailed instructions and explanations of how to use the site and how to play the prediction game during events.

Extras and Changes

The following pieces of implementation were also involved in creating the web application:

- On the live event page, when the status is unofficial, we simply continue to display the same full standings table that is shown when in progress and when official.
- It was originally scoped to display rank in the login box when a user is logged in. However, the rank causes a lot of issues. It was believed that it would be simple to perform a query and work out the rank of a user, however, this is a lot more challenging than anticipated. There is no simple way of working out a rank without a lot of data processing, and storing the rank as its own field also causes issues. Even if we were to store the rank, it would be almost impossible to keep this updated and correct during events when totals are changing as this is a highly intensive operation, particularly if there are a large number of users. Because of this, the rank has been removed from this prototype. In a full version however, rank is a very important part of the prediction game, so we would need to design a way to store and update these ranks. A potential solution is to follow the method used by the Fantasy Premier League web site that was looked at in the beginning of the project. Here, they only update user ranks in a bulk period after matches have taken place- ranking tables are not updated during live periods.
- The hide/show functionality has been implemented on the predictions history page, and it was originally intended to be used in the start lists and standings tables as well. However, there has been difficulty with this. As the amount of teams that can appear in these tables is dynamic, this makes it difficult to implement the same toggle function. The problem is that we cannot call show/hide on multiple elements of the same type separately- i.e. one hidden row is shown, while another remains hidden. With further investigation a solution to this could be found, however this is a potentially time demanding issue that could halt the progress of the project. Because of this, it has been decided that an acceptable solution is to use a single toggle button that shows and hides all of the hidden rows at once. Although this is not as user friendly, it still achieves the same means of being able to show and hide the detailed information.
- The application was originally planned to store the judge's average score in the predictions table, but during implementation it became apparent that this was redundant as the average is already stored in the dives table. Although storing it in the predictions table may

increase efficiency when querying, it means we are filling the database with unnecessary information so I have decided to remove this data from this table.

- The application originally used user ID as a field in the users table, however this field is not needed. This originally acted as a primary key, but because a user is forced to use a unique username when registering we can instead use the username field as a primary key and do not need to store a user ID.

Completion

Now that implementation is complete, please see the following screenshots showing the application in demonstration.

Please complete all registration fields

Register

Complete the form below to register, allowing you to play the prediction game during events!

Username

Your desired username
(Max. 25 Characters)

Mr.Test

Email

Add a valid email address

email@address.com

Confirm Email

Confirm your email address

email@address.com

Password

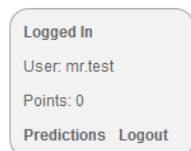
6 - 25 Characters

Confirm Password

Confirm your password

Register

First a new user registers and then logs in



[Home](#) [Events](#) [Predictions](#) [Diving Rules](#) [About](#) [Contact Us](#)

Women's Synchronised 3m Springboard

July 29 2012 15:00 - Scheduled

No start list available at this time



The event page is ready for data

Women's Synchronised 3m Springboard

July 29 2012 15:00 - Scheduled

Start List

Order	Team				
1	Italy	Tania Cagnotto	Francesca Dallape		
	Dive No.	Dive Code	Dive Description	Position	Difficulty
	1	101B	Forward Dive	Pike	2.0
	2	301B	Reverse Dive	Pike	2.0
	3	205B	Back 2 1/2 Somersault	Pike	3.0
	4	5152B	Forward 2 1/2 Somersault 1 Twist	Pike	3.0
	5	405B	Inward 2 1/2 Somersault	Pike	3.0
2	Australia	Anabelle Smith	Sharleen Stratton		
	Dive No.	Dive Code	Dive Description	Position	Difficulty
	1	201B	Back Dive	Pike	2.0
	2	301B	Reverse Dive	Pike	2.0
	3	405B	Inward 2 1/2 Somersault	Pike	3.0
	4	107B	Forward 3 1/2 Somersault	Pike	3.1
	5	5152B	Forward 2 1/2 Somersault 1 Twist	Pike	3.0



The start list for the event is sent

Women's Synchronised 3m Springboard

July 29 2012 15:00 - In Progress

Current Team

Team	
Italy	Tania Cagnotto Francesca Dallape

Dive No.	Dive Code	Dive Description	Position	Difficulty
1	101B	Forward Dive	Pike	2.0



Prediction

Input Your Score (Must be in format x.x and between 0.0 and 10.0):

Submit

The event begins and the first team becomes current

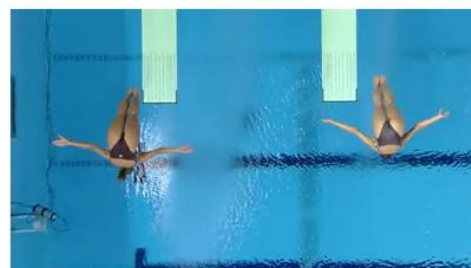
Women's Synchronised 3m Springboard

July 29 2012 15:00 - In Progress

Current Team

Team	
Italy	Tania Cagnotto Francesca Dallape

Dive No.	Dive Code	Dive Description	Position	Difficulty
1	101B	Forward Dive	Pike	2.0



Prediction

You scored the dive 8.5

A score prediction is entered for the team

Women's Synchronised 3m Springboard

July 29 2012 15:00 - In Progress

Previous Team

Rank	Team		Total
1	Italy	Tania Cagnotto Francesca Dallape	52.20

Dive No.	Dive Code	Dive Description	Position	Difficulty
1	101B	Forward Dive	Pike	2.0

E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score
8.5	8.5	8.5	8.5	8.5	9.0	9.0	8.5	9.0	8.5	9.0	0.0	8.7	52.20



Prediction

You scored: 8.5
Average Judge's score: 8.7
You gained: 16 points!
Your Games total is now: 16 points!

The results are sent and the points gained for the predictions is calculated

Standings

Rank	Team												Total																																																				
1	China		Minxia Wu						Zi He				54.00																																																				
<table><tr><th colspan="2">Dive No.</th><th colspan="2">Dive Code</th><th colspan="6">Dive Description</th><th>Position</th><th>Difficulty</th></tr><tr><td colspan="2">1</td><td colspan="2">101B</td><td colspan="6">Forward Dive</td><td>Pike</td><td>2.0</td></tr><tr><th>E1</th><th>E2</th><th>E3</th><th>E4</th><th>E5</th><th>E6</th><th>S1</th><th>S2</th><th>S3</th><th>S4</th><th>S5</th><th>Pen</th><th>Avg</th><th>Score</th></tr><tr><td>9.0</td><td>8.5</td><td>9.0</td><td>8.0</td><td>8.5</td><td>9.0</td><td>9.0</td><td>9.0</td><td>9.0</td><td>9.5</td><td>9.5</td><td>0.0</td><td>9.0</td><td>54.00</td></tr></table>														Dive No.		Dive Code		Dive Description						Position	Difficulty	1		101B		Forward Dive						Pike	2.0	E1	E2	E3	E4	E5	E6	S1	S2	S3	S4	S5	Pen	Avg	Score	9.0	8.5	9.0	8.0	8.5	9.0	9.0	9.0	9.0	9.5	9.5	0.0	9.0	54.00
Dive No.		Dive Code		Dive Description						Position	Difficulty																																																						
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Dive No.		Dive Code		Dive Description						Position	Difficulty																																																						
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3	Australia		Anabelle Smith						Sharleen Stratton				49.20																																																				
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7.5	8.5	7.5	7.0	8.0	8.0	8.5	8.5	8.5	8.5	8.5	0.0	8.2	49.20																																																				

As the event progresses, the standings table populates

Women's Synchronised 3m Springboard

July 29 2012 15:00 - Official

Medallists

GOLD	China	Minxia Wu
		Zi He
SILVER	United States	Abigail Johnston
		Kelci Bryant
BRONZE	Canada	Emilie Heymans
		Jennifer Abel



WOMEN'S SYNCHRONISED 3M SPRINGBOARD			
RESULT - FINAL			
1	CHN	WU MINXIA / HE ZI	346.20
2	USA	ABIGAIL JOHNSTON / KELCI BRYANT	321.90
3	CAN	EMILIE HEYMANS / JENNIFER ABEL	316.80
4	ITA	TANIA CAGNOTTO / FRANCESCA DALLAPE	314.10
5	AUS	ANABELLE SMITH / SHARLEEN STRATTON	304.95
6	UKR	ANNA PYSMENSKA / OLENA FEDOROVA	302.40
7	GBR	ALICIA BLAGG / REBECCA GALLANTREE	285.60
8	MAL	P.R. PAMG / J.H. CHEONG	283.50

Results

Rank	Team			Total	+
1	China	Minxia Wu	Zi He	346.20	
2	United States	Abigail Johnston	Kelci Bryant	321.90	
3	Canada	Emilie Heymans	Jennifer Abel	316.80	
4	Italy	Tania Cagnotto	Francesca Dallape	314.10	
5	Australia	Anabelle Smith	Sharleen Stratton	304.95	
6	Ukraine	Anna Pysmenska	Olena Fedorova	302.40	
7	Great Britain	Alicia Blagg	Rebecca Gallantree	285.60	
8	Malaysia	Pandelela Rinong Pamg	Jun Hoong Cheong	283.50	

When the event is over the medallists are sent

Your Predictions:

Expand an event to see your record

Women's 3m Synchronised					-
Your total points for this event: 142					
Team	Dive No.	Prediction	Judge's Average	Points	
Australia	2	8.0	8.2	16	
Canada	1	9.0	8.9	18	
China	1	9.0	9.0	20	
China	2	9.0	8.8	16	
Great Britain	1	8.5	8.3	16	
Great Britain	2	8.5	8.7	16	
Italy	1	8.5	8.7	16	
Italy	2	8.0	8.7	5	
Malaysia	1	7.0	7.7	5	
United States	1	8.5	8.8	14	

We can go to the predictions page and see a record of the predictions for that event

Leaderboard

Rank	Username	Total Points
1	davedave	576
2	mr.test	142
3	test2	37
4	me	32
5		0
6	test	0
7	test1	0
8	test10	0
9	test3	0
10	test4	0

Testing

Although many technical aspects of the application were tested as it was implemented, it is important to perform a formal testing process to make sure that there are no obvious defects. There are two main testing methodologies that can be used- white box and black box testing. White box testing focuses on explicit knowledge of the internal workings of the item being tested, and test cases focus on testing individual items of code and validating the output. Black box testing examines the functionality of an application without peering into its internal structures or workings. Test cases focus on verifying what the software does rather than how it does it.

To test this application, test cases will be written based on the black box testing methodology. White box testing can often be very detailed and complex and thus can take a great deal of time. In relation

to this project, it would be inappropriate to take such a strategy as application is intended to be a prototype, not a real world piece of software. Although the intricacies of the system are important, the key aim to demonstrate here is the functionality of the project, therefore it makes much more sense for this to be the focus of the testing activity. Some white box testing has already informally conducted while implementing the system so with such limited time and resources it may not be greatly beneficial to perform white box testing, as this may not result in finding defects or improving areas that have a great deal of impact on the system. Black box test cases will be written that focus on the functionality of the system, which should be simple as these test cases can largely be drawn from the design phase where the detailed functionality of the system was specified.

Functional Testing

As previously stated, time for testing is limited and as this is a prototype we will only be focusing on testing the core functionality of the application. An example of a test case follows. The full set of test cases executed can be found in Appendix F.

Test Case	Step	Description	Expected Result	Actual Result	Pass / Fail
Start List	1	Start List displayed	Start list available	Start list available	✓
	2	Automatic refresh when updated	Page updated	Page updated	✓
	3	Start List with no dives displayed	Start list available	Dives sub-table headings still shown	X
	4	Check expansion show/hide	Expansion works	Expansion works	✓

The testing process was mostly successful, with the majority of test case steps passing. However, a few small defects were found:

- When a start list is sent and the dive list is still unknown, the start list still has the hidden row for the dives and the headings for the dives sub table. To fix this we need to deal with the case that the dives query returns zero rows and build an alternate start list table with the dive rows absent.

Women's Synchronised 10m Platform

July 31 2012 15:00 - Scheduled

Start List

Order	Team		
1	China	Ruoling Chen	Hao Wang
<div> <div>Dive No.</div> <div>Dive Code</div> <div>Dive Description</div> <div>Position</div> <div>Difficulty</div> </div>			
2	Ukraine	Viktoria Potyekhina	Iuliia Prokopchuk
<div> <div>Dive No.</div> <div>Dive Code</div> <div>Dive Description</div> <div>Position</div> <div>Difficulty</div> </div>			
3	Australia	Rachel Bugg	Loudy Wiggins
<div> <div>Dive No.</div> <div>Dive Code</div> <div>Dive Description</div> <div>Position</div> <div>Difficulty</div> </div>			
4	Germany	Christin Steuer	Nora Subschinski



- When the event goes to “in progress”, the start list is removed but the page is blank until the first team becomes current. To fix this a check to see if the highest sorted team has a rank was added. If they have no rank, then we know no team has dived yet so we can continue to display the start list. Otherwise we can display results.
- Predictions appear in the predictions table before the points have been assigned. This is because the prediction is inserted into the database before the results are in. To fix this, we need to use a check on the “added” field so we know to only display predictions that have been processed.

Your Predictions:

Expand an event to see your record

Men's 3m Synchronised				
Your total points for this event: 0				
Team	Dive No.	Prediction	Judge's Average	Points
Russia	1	8.5		0
Women's 3m Synchronised				
Your total points for this event: 279				
Women's 10m Synchronised				
Your total points for this event: 277				

Leaderboard

Rank	Username	Total Points
1	davedave	556
2	me	32
3	test	0
4	test1	0
5	test10	0
6	test2	0
7	test3	0
8	test4	0
9	test5	0
10	test6	0

- The register page currently allows a blank username to be registered. To fix this we simply need to implement a check on the field to make sure it is not null, or perhaps impose a lower character limit.

	id	username	password	email	total
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	4	me	f30aa7a662c728b7407c54ae6bfd27d1	me@me.com	32
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	5	test	cc03e747a6afbbcbf8be7668acfebee5	test@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	6	test1	cc03e747a6afbbcbf8be7668acfebee5	test1@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	7	test2	cc03e747a6afbbcbf8be7668acfebee5	test2@test.com	37
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	8	test3	cc03e747a6afbbcbf8be7668acfebee5	test3@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	9	test4	cc03e747a6afbbcbf8be7668acfebee5	test4@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	10	test5	cc03e747a6afbbcbf8be7668acfebee5	test5@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	11	test6	cc03e747a6afbbcbf8be7668acfebee5	test6@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	12	test7	cc03e747a6afbbcbf8be7668acfebee5	test7@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	13	test8	cc03e747a6afbbcbf8be7668acfebee5	test8@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	14	test9	cc03e747a6afbbcbf8be7668acfebee5	test9@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	15	test10	cc03e747a6afbbcbf8be7668acfebee5	test10@test.com	0
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	16	davedave	587a56c91123a44fe2099d7f5f415919	d@d.com	576
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	17		5f4dcc3b5aa765d61d8327deb882cf99	me@lowwwwl.com	0

- When multiple browser windows are open with the site, or the site is open in multiple tabs, the automatic update will only work in the page that was opened first. This is a strange problem, as all of the browsers work individually, so this requires further investigation. This issue may be related to the JavaScript timer that is used to check the database- perhaps this only allows one browser or page to use the system time at once, so the function only works on a single page.

These defects are of a low severity as they do not affect the core functionality of the application. Therefore, due to time restrictions they will not be fixed now, but will instead be left as future work, or fixed if there is a suitable amount of time remaining at the end of this project.

Usability Evaluation

As a part of the testing phase, it is also important to evaluate the usability of the application now that it is complete. To do this, the application will be evaluated against Nielsen's ten usability principles (Nielsen, 1995). These principles act as guidelines to adhere to when creating any user interface and by applying them to the application we should be able to see its strengths and weaknesses. At this point, it may be difficult to implement any changes needed due to time restrictions, however, this evaluation can be used to plan how the user interface can be improved for a complete real world application.

Visibility of system status

The dynamic parts of the application show the current status of the event, and combined with the video stream allow users to follow the progression of the event. However, some users may not use the video stream, and may wish for more feedback about when an update has occurred. It may be useful to include some sort of time stamp at the bottom of the event pages to show when the page was last updated.

Match between system and the real world

The application matches the real world well as it uses intuitive navigation and user functionality (registration, login etc.) that are familiar to users as they are similar to that found all over the web. The area where it may be more difficult for users is the event pages where the layout and terms used is very sport specific. Tool tips could be used to make this more user friendly.

User control and freedom

User control and freedom is prevalent throughout. As the application is mostly focused on information consumption the user has simple control over what they view and whether they wish to input predictions or not.

Consistency and standards

As the application is relatively small, it is simple to adhere to the same standards throughout. This is aided by the layout and presentation styles that are used throughout. The forms could be improved to include more information about what to put in each input- for example having text in the input that disappears when clicked.

Error prevention

Error checking on features such as user registration, predictions etc has been included. However this could be improved as at the moment errors are only checked when forms are submitted. It would be better if we could check the form dynamically as it is being entered to provide immediate user feedback. This would be particularly useful for forms like the registration form where we only report one error at a time, even if there are multiple errors.

Recognition rather than recall

The application focuses on information consumption, so to do this all available information is presented to the user. For example, the standings table means users can see all statistics about the event rather than having to remember what is going on in the competition.

Flexibility and efficiency of use

The application is not hugely complicated for users, so it is not vital or particularly useful to include shortcuts and ways of speeding up interaction as the aim is to follow the chronological events of the real competition.

Aesthetic and minimalist design

The clear layout and colour scheme make the design one of the strongest elements of the application. However, there are areas that could be further improved. Although the show/hide feature of sub-tables is good, when these sub tables are shown they are too similar to the main tables. This makes the page begin to look cluttered and hard to read. With more time, these sub-tables could be improved on so that data can be distinguished better and is thus more readable.

Help users recognize, diagnose, and recover from errors

The error messages that are in use are clear and concise and completely inform the user of exactly what the problem is.

Help and documentation

This is an area that has been mostly an afterthought as it is not vital to this project, but would need to be worked on for a full application. As this is only a prototype some explanation of the rules of diving have been included, but for a real world application this would need to be presented in a much better way. The use of diagrams and video may be useful here. It is also necessary to go into greater detail to explain how the prediction system works so users fully understand how to use it.

User Testing

Having analysed the application internally, it is now important to gain feedback from potential users through user testing. This will help to verify that the application is usable, effective and also that the general idea behind it is appealing. To get this feedback, users are given the chance to browse the application, and then a live event is simulated. They are then completed a questionnaire.

When designing the questionnaire, one of the key elements was to not ask too many questions and to keep these questions short and simple. This was to ensure that users can complete the questionnaire in a reasonable amount of time without becoming uninterested and without having to spend time dissecting the meanings of questions. By doing this, users are much more likely to provide honest answers that provide an accurate reflection of their thoughts. It is also important to make sure that questions are not leading, so that a user's answer is as unbiased as possible. Because the questionnaire must not be too long, and given that the application is a prototype, the questions focus on getting a user's opinion on the key functional elements of the application:

- Core design elements like navigability, layout, presentation
- Core functionality such as registration, login, using the contact form
- The priorities of the event pages- clarity, completeness of data, ability to follow the event
- Simplicity and fun of predicting scores and opinion on predictions
- Overall opinion of the application and if it would be used again

These topics are most relevant to gauging how potential users would receive such an application were it developed fully. When it comes to answering the questions, answers need to be short and simple to improve the experience for the user, and to also make sure that questionnaires can be compared easily to achieve meaningful results. To achieve this, the questionnaire uses a 1 – 5 scale (i.e. very bad to very good) for each question, with the particular wording dependent on the question. Users can also leave any additional comments they may have if they wish to justify an answer or give feedback that is not captured entirely by the question. So, an example question would be:

How simple is it to predict scores?

Very Difficult ☐

Difficult ☐

Neither Difficult or
Simple ☐

Simple ☐

Very Simple ☐

Any Comments?

The questionnaires were completed by six potential users. The completed questionnaires can be found in Appendix J. The results were as follows (the table shows the frequency of the response):

Question	Response Given (1- very poor, 5- very good)				
	1	2	3	4	5
Rate the navigability of the application				4	2
Rate the layout of the application				2	4
Rate the presentation of the application				5	1
How was registration?			1	1	4
How was logging in?				4	2
How was the contact form?				2	4
How clear is results information?				5	1
How complete is results information?			1	1	4
How simple is it to follow an event?				4	2
How simple is score prediction?				5	1
How fun is score prediction?			1	3	2
Rate the predictions history page				5	1
What is your overall opinion?				4	2
	Yes			No	
Would you use the application again?	6				

From these results, and the various comments that were also left, the following feedback was gained:

- Users like the core design of the application- layout, presentation and navigation and find this makes the application simple and effective. Some commented that the colour scheme could have greater variation rather than being just monochromatic.

- Users found the login, registration and contact forms simple to use. Some users expressed the need for email validation, as currently you can enter any email address, and for a password reset feature.
- Users find the results pages to be very complete and can follow the progress of events easily. Some small improvements were suggested, such as including score strikeouts, allowing whole numbers in the prediction form (e.g. 9 instead of 9.0) and to make the show/hide functionality more obvious (although the ability to show/hide the detailed information was well received).
- Users found that the incorporation of score prediction was fun, and this was one of the main attractions of the application. Users enjoyed the competitive nature of this so much so that the feedback was that they would like it to be even more competitive and social so they can go against their friends.

Overall the application was very well received with all users indicating that they would use the application again, and would enjoy seeing it during a real event rather than a simulation. Constructive feedback was given on how the application could be improved, and these will certainly be incorporated into future work. It was expected that users would find some issues and have suggestions, particularly because they were presented with what is intended as a detailed prototype rather than a full application. Trivial features such as email address validation, tweaking the colour scheme and including strikeouts on scores can all easily be implemented in a full application, so these small issues are not of great concern when looking at the overall project. The key thing to take from this user feedback session is that the score prediction is very much a driving element of the application that users enjoy, and would really like to see it expanded upon further.

Results and Evaluation

Project Results

Having now completed implementation I can see that I have achieved my aim for this project. I have implemented my own Results Information System for Diving, powered by the Olympic Data Feed, which allows users to follow live events with results and statistics and incorporates score prediction. Looking back, I have managed to deliver all of the deliverables I set out at the beginning of the project:

- Implement a dummy version of the Diving Olympic Data Feed so that messages can be sent and received, and then processed.
- Parse ODF messages and store the data contained in a database, to allow for meaningful use in the main application.
- Provide a main application interface for users to view results information
- Provide results information (previous diver scores, current standings etc.) in real-time as ODF messages are received during simulation of competition.
- Allow users to interact with the system during competition by predicting scores

I believe that this prototype demonstrates how a full application could be utilised in real events. Since London 2012, diving is becoming an increasingly popular sport with greater exposure of events. As I have been working on this project, I have already seen two possible areas which my application

could be applied to. The FINA diving World Series is currently taking place between 19 -21 April. For this event, FINA are providing live streaming online so people around the world can watch, however results information is severely limited. The results information for this event is simply final standings tables that are posted on a separate page of the site post event, so there is no way for those watching the live stream to follow the detailed results and statistics as the event progresses. This is where I believe an application like mine could be of great benefit.

Diving is also becoming popular in the area of reality television where the show “Splash!” has recently attracted 5 million weekly viewers in the UK, and also has several international versions. The series follows celebrities as they try to master the art of diving. The celebrities perform each week in front of a panel of judges and a live audience in an Olympic-size diving pool with the result each week partly determined by public vote. With such a large amount of viewers, the idea of score prediction and “playing along” could easily translate to a television show like this for greater viewer interaction. I believe that these two examples both show that there is a gap in the market where a similar application to that which I have implemented could be used to allow users to follow and predict events happening in real diving events or during television shows like Splash.

I believe the application is very suitable for its intended audience of sports fans interested in following live results. This audience is very wide, particularly when it comes to the attractive nature of Olympic events, as it encompasses hugely diverse amounts of people. My user testing indicates that I have been successful in creating an application for this audience as feedback generally showed that they were happy with both the design (layout, presentation, navigation etc.) and the core functionality (registration, login, following events etc.). The key difference between my application and others is the integration of user prediction, and this does seem to be a very positive inclusion in the application. The users found this to be a very fun addition and the main bulk of feedback on the application as a whole was that they would like to see this taken further, with a greater competitive focus between users and their friends. I believe that not only does this show that the application is successful in pleasing its target audience, but also that I have been able to demonstrate the effectiveness of a new idea. It is of course important to note that due to the time and resource constraints in this project, that the user testing would need to be conducted much more thoroughly with many more users to increase the reliability of these findings. Although the initial results from my small amount of user testing are encouraging.

In terms of the prototype itself, although I have successfully achieved the functionality I set out to implement, I think that my actual implementation of it could be improved. This project is the first time I have developed a full scale dynamic web application, so is largely my first exposure to the more intricate elements of PHP, AJAX and JavaScript. Although I managed to achieve the functionality, I feel this inexperience definitely hindered my ability to implement it due to the amount of learning required in order to work with these technologies. For example, my form processing and show/hide JavaScript functions work but do use more primitive techniques, and in a real world application may not be completely resilient to modern testing standards. This learning curve did make the project challenging and as the aim was mainly to create a prototype that demonstrates my idea, I feel that this is an appropriate outcome from the project. I do believe that with greater experience in web applications I would be able to achieve the same functionality but in a much more efficient way that complies with the most up to date standards and techniques.

Although my techniques could be refined, the key element to take away from this project is the successful demonstration of the idea rather than the detailed intricacies of how this is achieved.

Although I deem the project to be a success, on reflection I feel that the original idea was a limiting factor. My experiences at the Olympic Games lead me to be very focused on live events and processing live ODF messages and now that I have completed this implementation I can see other ways which the application could've been adapted. The prototype I have created demonstrates the idea of integrating results and user interaction well, however as it focuses solely on the Olympics, the actual prototype has limited use other than reusing parts in applications based on other events. Upon reflection, it may have been better to have designed a much more generic application that can be translated to different scenarios much easier. For example, at the moment the application acts as a simulation of a live event that happens in the background, demonstrating what could be done with live events and the Olympic Data Feed. However, if the simulation were more open, so that users could replay events themselves at their own leisure then the application would've been much more accessible. Although I do feel I have successfully demonstrated a strong idea in this project, I do feel that the actual application I produced could've been open to a much wider audience had I not limited it by focusing on recreating the Olympics.

Another limitation I feel I put on myself was by developing the application on a local server. Although this choice was largely due to the convenience of being able to work from a single station in a project extremely limited by resources and time, I believe it would have been beneficial to have the applications working with a live server with many clients. This would have allowed the application to demonstrated as it is intended to be used- with a background client sending messages while several users use the web application on different clients. If I had scoped for this early on in the project it may have been possible, however I do feel that doing so may have increased the risk of project failure, so perhaps it was a good decision to work locally.

Overall, I acknowledge that improvements can be made to the original idea and the implementation techniques used, but I believe that this project has successfully demonstrated a way to incorporate live sports statistics and user interaction through a web application, and this idea could easily be taken to produce such applications for real world events.

Future Work

The results of this project have given me many ideas on further work to continue it, both by improving the current solution and adapting it to create new applications. In terms of improving the application I would like to:

- Fix the small defects found in testing and improve the user interface based on the usability evaluation.
- Continue implementation so that the application can be used for individual events and can also handle exceptional cases such as disqualifications, re-dives, and revisions to results and start lists.
- Improve the score prediction process. At the moment the prediction process is very simple, and although it engages users I feel that it could be improved. Predicting a single score and this being compared to the judge's average is not fully reflective of the scoring process in diving, particularly in synchronised events. In synchronised events the two divers' execution

and synchronisation are judged individually, so it may be better to allow the user to score both aspects of the dive. The calculation of points could also be better. Currently the average can end up being something like 8.9, which isn't a valid score in diving as scores increment by 0.5. It may be better to use an alternate scoring method, such as awarding points based on each individual judge score rather than the average. Score predictions could also be further improved by making it a more competitive process. The fantasy premier league website I looked at in the early stages of the project allows users to create leagues to go against their friends as well as leagues for different countries and supporters of different teams. If this feature were incorporated into my application it could help make the score prediction much more social and competitive, and therefore much more likely to be used.

- Make use of the full range of data available in the ODF feed. There are many more messages and data items contained in the feed that could be incorporated into the application. Results can be added to by including score eliminations, information about the rankings of each round, which was the highest scoring dive etc. We can also include other information linked to the application such as biographical athlete information, information on judges and officials and medal standings tables. This would create a much fuller and complete results information system.
- Improve cross platform functionality of the application. This has largely been an afterthought in this project due to time constraints and the massive difficulties that cross platform interoperability poses. It would be good to create multiple styles to support different resolutions, fully test the application in all browsers and see how the application behaves on mobile browsers since this is a huge source of web traffic these days.

In terms of furthering the application into new territories and developing new applications, I can see a few possibilities:

- The application is focused on live events at the moment, so the user can only use it during a live event with messages being sent by some controller of the message feed. The application could be used much more widely if the application could be extended for the user to have control over the playback of events to simulate the event themselves. For example, play back buttons could be introduced alongside the video, so that the user can play and pause the event as they wish, with the results updating at the correct intervals. This would allow users to use the application at any time, and to play the score prediction game whenever they choose. Though of course this does bring in other issues such as already knowing the scores of an event that has already happened, so there would need to be a way to reduce the possibility of cheating to make sure the game is fair for all users.
- Score prediction could be taken further, and rather than just being a "play along" feature could be used as a way to help train diving officials. Instead of being used for whole events, the score prediction could instead be used for sets of dives from many different competitions. A user could be presented with footage of many different dives and asked to score them, with their accuracy to the real scores used to measure if they are a good judge or not. This could also include different difficulties, such as seeing the dive once at normal speed (as real diving judges do) and then an easier version having the benefit of a slow motion replay. This sort of application could be very useful as part of the technical official training process.

- As I discussed earlier, I believed that focusing solely on the Olympics was a limiting factor on this project. This gave me the idea of using the application as a framework as part of a larger application, that would allow live results and score prediction to be incorporated into their own events. An application could be created where a user puts in the schedule of their own diving event and then live event pages are generated to create the live results pages specific to that event. This would allow the application to be used much more diversely over multiple events and remove the need for event organisers to create a new web site for each event to display results. Of course the application does rely on use of the Olympic Data Feed for its data and operation, but this is now being used more commonly outside of the Olympics. For example, there is now an ODF specification for the 2014 Commonwealth Games, so this application could be translated to that event as well.

Project Management Evaluation

The final Gantt chart showing the actual progression of the tasks in my project can be found in Appendix G.

Looking at this final Gantt chart, I can see that the largest difference between the original plan and the actual timings of tasks is in the implementation section. The implementation was finished approximately three weeks ahead of schedule with the majority of tasks taking much less time to complete than originally anticipated. Finishing the implementation so much earlier has definitely been beneficial, as it has taken some of the pressure off when approaching the submission deadline and has given me a lot more time to focus solely on this report, where originally it was mostly going to be written in parallel with implementation. Estimating the duration of implementation was always going to be a challenge, even though I broke it down into many sub-tasks. The nature of implementation is that many problems can occur that take a long time to resolve, so I think it was always a good idea to scope for these by overestimating the duration. This meant that had something gone wrong in implementation, the project would still likely be on track.

Apart from the implementation, my original project plan was generally accurate and I was able to work to the dates I set successfully. I think this was largely due to re-evaluating the project plan often and at key points in the project. This was something I feel was key to keeping the project on track and allowed me to minimise risk of project failure. I think it is very important to continually monitor project plans and make changes where necessary as these changes are always likely to happen throughout the project lifecycle, so I feel it was a great benefit to be able to do this during this project.

Looking at my original project plans, I feel a weakness is that I really did not plan a lot of slack into the plan. This project was always going to be challenging given the time constraints, so it was important to try and complete as much work as possible. However, on reflection I can see that not planning slack space was a risk that could have lead to a lot of problems. Fortunately this was not an issue as I actually ended up over estimating the bulk of implementation, but had this actually over run then it would have been necessary to either take less time on some tasks or to not complete them at all could have resulted in not meeting my project aims and deliverables. As I did over estimate the duration of implementation but also left no slack space, in future I think it would be better to find a healthy middle ground- a plan where I take into account that problems can occur so over estimate task duration a little, but also include slack space so that if a serious problem does

occur, the impact on the rest of the project can be managed rather than causing scheduling difficulties.

One thing I would improve in future is recording the progress of the project to aid the writing of this final report. For the interim report I did this well, which made putting the report together much simpler, however in this second part of the project it was easy to get carried away with the implementation and I didn't maintain my record keeping and notes as well as I did previously. This made putting the report together more difficult as a lot more use of memory was required. In future, I would definitely make sure I kept a detailed diary throughout all phases of the project. This report is on track but I think I would have been able to complete it much earlier if I had done this, leaving much more time to make revisions and to verify the content.

Conclusion and Learning Outcomes

In conclusion I believe that this has been a successful project that has met the aims and deliverables I set at the beginning. I believe my application acts as a strong prototype to demonstrate the integration of results information and user interaction for a live sporting event and could now be taken forward in many different directions. I feel that I accomplished this through a strong project management approach that allowed me to continually re-evaluate the project, minimising the effects of changes and the number of problems encountered.

As well as having a physical output from this project in the form of my application, I believe it has also provided several learning outcomes for me. I feel that working on this project has mostly aided my personal development by allowing me to apply the various skills I have gained during my time at University to a single project. The project also provided a great learning opportunity building a relatively full scale web application, an area which I did not have a great amount of experience in. This gave me much more exposure to technologies like PHP and AJAX which I would not otherwise have gained. I feel that combining this project with my work placement at London 2012 has also allowed me to push further on with the skills I gained working there, and has allowed me to demonstrate the benefits I found by going on a year's placement. Throughout this project I have used my skills in project management, programming, communication, design, systems modelling and then had to critically evaluate my performance in these areas. I believe this is something that has definitely prepared me for real life work in a project environment, whatever part of the lifecycle it may be in.

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