Master Thesis in Science Communication

Gloria Tiny Seitei
Supervisor: Lars Broman
Local supervisor: Valerie Collins

Front End Evaluation of 'Tester' Exhibition to be Developed into a Travelling Sports Exhibition

HDa-SC-07
## Contents

Abstract 5

Keywords 5

1. **Introduction** 6
   1.1 About At-Bristol 6
   1.2 Background to Sportastic 7
   1.3 How and why the evaluation was chosen 7
   1.4 Aims of the evaluation 8
   1.5 Front-end evaluation 8
   1.6 Previous knowledge 8
   1.7 Theoretical background 9
   1.8 Acknowledgements 10

2. **Methods** 12

3. **Observations** 14
   3.1 Sprint Challenge 14
   3.2 Virtual Volleyball 17
   3.3 Shooting Hoops/Basketball 20
   3.4 Hot shots/Football 23
   3.5 Skeleton Bob 25
   3.6 Meet the Expert 27
   3.7 Large Presentation/… 28
   3.8 Have Your Say 29
   3.9 Java Café 30
   3.10 BATAK/Test Your Reaction 32
   3.11 Skateboard Challenge 34
   3.12 Test Your Pulse 36
   3.13 Mini Sports Arena 38
   3.14 Wheelchairs 40
   3.15 From Past Times to Fast Times 42
   3.16 Stinky Shoe 44
   3.17 Test Your Grip/Strength 45
   3.18 Beat the Goalie/Hockey 48
   3.19 Explainers Comments on 60 Seconds Circus 50
   3.20 General Explainers Comments… 50
   3.21 General Observation on Sportastic 51
   3.22 Visit to Science of Sport… 52
   3.23 General Observation on Science of Sport 57
Abstract

The purpose of this evaluation is to develop a framework that will help in planning and implementing the mobile sport exhibition, increase visitor satisfaction and aid At Bristol in building successful exhibits. The evaluation mainly focuses on visitor interaction with exhibits. It is believed that learning does occur in science centres and museums. The evaluation will therefore find out if learning occurs in the Sports exhibition and if so, the nature of the learning outcomes. The evaluation also discusses advantages and disadvantages of travelling exhibitions and identifies the characteristics of good exhibits that form the basis of the framework.

From the results, an indication is that children make the larger proportion of visitors to Sportastic. Their age ranges, under 10 and 10 to 15 years constituted 21% and 30% respectively. The three most enjoyed exhibits are the Sprint Challenge (running), BATAK (test your reaction and Hot Shots (football). Visitors say these exhibits are enjoyed because they are fun, competitive, entertaining, interactive and hands-on. Skateboard Challenge and Skeleton Bob are among the exhibits least enjoyed since they are reported to be boring and uncomfortable to use. The learning outcomes from the exhibits are; increased knowledge about balancing, reaction, pulse and strength.

Keywords

Sportastic, hands-on, minds on, attraction power, exhibition, exhibits, interactivity, visitor observations, science centre, museum, informal learning, interaction.
1. Introduction

1.1 About At-Bristol

At-Bristol Science Centre was officially opened in July 2000. It is situated in the city of Bristol in the southern part of the United Kingdom (UK). It is a centre of excellence for active learning that engages all sectors of the community.

The aim of At-Bristol is to promote a wider interest and understanding of science, nature, environment, technology and the arts. At-Bristol is a cluster of informal learning experiences comprising a Planetarium, Explore-At-Bristol – the interactive ‘hands-on hub, Wildwalk-At-Bristol – the living rainforest in the city and natural world interpretation and an IMAX. The exhibition ‘Sportastic’ is a temporary exhibition situated in Explore.

Explore-At-Bristol covers such themes as ‘Your Amazing Brain’ in which there are exhibits on body and brain, brain matters, Gregory games, super senses and love and sex.

There is also a theme on ‘Move It’ where visitors can interact with a range of technologies to test their personal and staying power. Visitors build bridges, use pedal power to generate electricity, and a pulley mechanism and so on. Some of the exhibits that could be found in this section are: Machines, Strong Shapes, Water Works, Power It and Dream of Flight.

‘Curiosity Zone’ is a themed area from the first floor of Explore-At-Bristol. Within this theme, visitors can stimulate their sense of wonder and excitement by investigating light, sound, forces and nature. In-situ environment consist of a planetarium, simulators, television studio for kids and a theatre space. Further site features include a food and flavour laboratory, a solutions laboratory, electronic outreach programmes, shops and cafes.

Wildwalk-At-Bristol gives visitors an opportunity to experience the natural world and learn about small creatures and other forms of life. For example, stunning audio visual interactive reveals the lives of animals and plants. The visitor can also experience the real thing will a botanical house and live specimens on show. Themes within Wildwalk-At-Bristol include ‘Simple Beginnings’, about the beginnings of life on earth, the astonishing array of life on our planet and the biodiversity.

The ‘Botanical House’ theme covers plant evolution and the first transitions to land that occurred 500 million years ago. Another theme is ‘Animals on Land’. Animals on Land invite visitors to look at land invasion of the legged kind. In here visitors are able to discover the problems these terrestrial settlers had to overcome and find out, for example, why life on six legs is successful.

‘Living Planet’ is a unique combination of plants and animals surviving in different regions on earth from intricate communities. While on the other hand ‘People and Planets’ is a theme that provides an insight into threats of extinction of species and ways in which we can ensure the sustainable future of our living planet.
Lastly there is the ‘IMAX Theatre’ that explores themes of science history and the natural world. This is the only IMAX theatre screen available in the South West of England.

1.2 Background to Sportastic

Science in sports is the latest trend in exhibits. It provides a ‘full body’ experience for visitors and gives science centres the opportunity to target new audiences and broaden market share.

According to information from At-Bristol leaflets, Sportastic is a ‘tester exhibition’ launched by At-Bristol Science Centre and scheduled to run for 8 months from April 2004 to November 2004. It is an interactive exhibit that provides ‘hands-on’, ‘body-on’ and ‘minds-on’ exhibits for people of all ages to test their skills and stretch their bodies and minds. Its purpose is to promote the diverse contributions made by sport to personal and social development. The exhibit was also developed as an experimental model to allow for live testing of a sport thematic structure.

The aim of this tester exhibition is to build a prototype exhibition and use it as a test bed to evaluate assumptions about the public and about the robustness of the interactive exhibits. Evaluation of this ‘tester’ exhibit is intended to form the basis of a large touring exhibition that will travel to other science centres and schools in different parts of the UK and will also be used to form a framework for At--Bristol’s future experimental exhibits.

Jenny Cave (1982) in her article, says that

“The success of an exhibit is usually gauged by attendance figures and our gut feelings as to what works in our museum. But can we really be sure of how well we are achieving our institutional objectives or whether visitors are receiving the intended messages, without some systematic method directly approaching the public”.

This is what this evaluation intends to address. With the evaluation of the current sports exhibition it is hoped that it will help in the planning and implementation of the mobile sports exhibition in terms of visitor satisfaction that will result in building suitable exhibits.

1.3 How and why the evaluation was chosen

The project was chosen after consultations with the Director of Exhibitions, Valerie Collins. This was to ascertain what has been done and not been done in terms of past evaluations and possibilities of on going evaluations. After consultations it was agreed that the newly launched sports exhibition, Sportastic should be evaluated on a front-end basis since it is to be developed further for a travelling exhibition.
1.4 Aims of the evaluation

Aims of the research are to assess a ‘tester sports exhibition’. This information will then be used to improve the prototype exhibition and use it as a test bed to evaluate assumptions about the public and about the robustness of the interactive exhibits.

Another aim of the research is to develop a framework for evaluating ‘tester’ exhibits intended to be expanded into large scale touring exhibition. The evaluation will use the newly launched Sportastic exhibition as a case study. This tester exhibition will form the basis of research for a larger touring exhibition that will travel to other science centres and schools in different parts of the U K.

A secondary focus of the research is to assess ways in which visitors engage in open discussions during their interaction with exhibits, whether they read labels, the amount of time spent at exhibits and finally explainers’ views about Sportastic exhibits; the effect of these exhibits on visitors and what they think could be improved or eliminated from the exhibition floor.

1.5 Front-end Evaluation

A question that might come to mind is why the author conducted a front-end evaluation of an already existing exhibition instead of a summative evaluation. According to Collins (2004), research accumulated in the planning stages, before implementation is considered front-end. This includes focus groups, staff interviews, observational studies on extant similar type exhibits, and exit and topical surveys.

When prototyping is included during the development process, such as testing concepts and text/words, through to hands-on life sized models of interactive exhibits and other components, this is called ‘formative’ evaluation also considered part of the Front-end work but a more iterative process. This is where At-Bristol positions the Sportastic exhibition as a live test bed for a larger travelling exhibition on the subject of Sports Sciences.

When planning this evaluation, At-Bristol wanted to know:

- If people enjoyed the Sportastic exhibition and why?
- Whether the visitors think that the title Sportastic represents the experience?
- If visitors think they have learned anything new from their visit to the exhibition (discussed in depth in Chapter 5)?
- What exhibits are popular and less popular with visitors and why?
- What visitors think in general of the exhibits?
- How they use the exhibits?
- What sort of improvements visitors would like to see in the exhibition space?

1.6 Previous Knowledge

No evaluations were found on sports exhibitions, except from Gotland County (2003) in Sweden. The information collected will be used in comparison with the results of this
evaluation. An in-depth description of the evaluation will be analysed further in Chapter 5. It was thought that since The Science Museum in London, UK has been operating the Science of Sport Exhibition, they might have conducted an Evaluation on that.

According to one of the officials at the Science Museum, Ben Gammon (2004), the research will be conducted from July 2004 and the results will be discreetly shared because of the fact that they will contain information that might be of commercial viability.

However, the evaluation of Sportastic exhibition can not be compared with the Science of Sports at the Science Museum in London. Observations of exhibits within Science of Sports were made and reviewed in chapter 3. But it should be noted - visitor observation was incomplete as during the time of the visit there were no visitors on the exhibition floor in London.

1.7 Theoretical Background

As stated in the introduction, the only evaluation that has been reviewed is Sport and Vetenskap (Sports and Science) from the Gotland County in Sweden (2003). The evaluation was conducted in November 2003. The evaluation was purely based on visitor opinions on the sport exhibition. From the exhibition in Gotland County there is more emphasis on exhibits on Sport and Science and Sports and Health.

The basic results of this evaluation indicate that the main visitors of the exhibition are people aged 13 to 25 years of age that constituted 54%. 12 years and younger were 38% and 25 years and over scored 6% and that majority of these visitors come from within Gotland County. 74% of visitors said that they have not visited sport and science before, 14% visited once, 10% twice and only 2% said they had visited on several occasions.

Visitors were shown to enjoy sports and science more as opposed to sports and health. The two were rated at 53% and 34% respectively. It is also indicated that visitors enjoyed the exhibits since they considered them to be fun, giving them an opportunity to interact with exhibits in a relaxed environment and learn about balancing, health and body as well as the heart rate.

As for reading labels, 66% of visitors said that they read labels while 29% said that they did not read labels and 5% did not give an answer. Another important aspect is that 61% teachers indicated that they will employ sports and science in teaching, Only 18% said no while 21% said maybe they will.

The evaluation is similar to the evaluation done within Sportastic At-Bristol in that visitors were asked which exhibits appeal to them, which do not and why? What is new in the results of an evaluation on Sportastic is the enjoyment factor and non enjoyment factor from the exhibits; educational benefits of exhibits; the question of ease of exhibits; what visitors would be interested in which would also be a useful part when making modifications; effect of sport on body; staff support; what visitors would like to see improved within an adult rest area and visitor comments on amenities that are not captured from the evaluation of the Gotland County Study.
The other difference could be noted on the fact that the evaluation done at Gotland County was only quantitative while this particular evaluation is both quantitative and qualitative. From reading the Gotland county evaluation, one would also come to the conclusion that this was specifically done for in house consumption on the impact of exhibits. As stated in the introduction, the only evaluation that has been reviewed is Sport and Vetenskap (Sports and Science) from the Gotland County in Sweden (2003). The evaluation was conducted in November 2003. The evaluation was purely based on visitor opinions on the sport exhibition. From the exhibition in Gotland County there is more emphasis on exhibits on Sport and Science and Sports and Health.

The basic results of this evaluation indicate that the main visitors of the exhibition are people aged 13 to 25 years of age that constituted 54%, 12 years and younger were 38% and 25 years and over scored 6% and that majority of these visitors come from within Gotland County. 74% of visitors said that they have not visited sport and science before, 14% visited once, 10% twice and only 2% said they had visited on several occasions.

Visitors were shown to enjoy sports and science more as opposed to sports and health. The two were rated at 53% and 34% respectively. It is also indicated that visitors enjoyed the exhibits since they considered them to be fun, giving them an opportunity to interact with exhibits in a relaxed environment and learn about balancing, health and body as well as the heart rate.

As for reading labels, 66% of visitors said that they read labels while 29% said that they did not read labels and 5% did not give an answer. Another important aspect is that 61% teachers indicated that they will employ sports and science in teaching, only 18% said no while 21% said maybe they will.

The evaluation is similar to the evaluation done within Sportastic At-Bristol in that visitors were asked which exhibits appeal to them, which do not and why? What is new in the results of an evaluation on Sportastic is the enjoyment factor and non-enjoyment factor from the exhibits; educational benefits of exhibits; the question of ease of exhibits; what visitors would be interested in which would also be a useful part when making modifications; effect of sport on body; staff support; what visitors would like to see improved within an adult rest area and visitor comments on amenities that are not captured from the evaluation of the Gotland County Study.

The other difference could be noted on the fact that the evaluation done at Gotland County was only quantitative while this particular evaluation is both quantitative and qualitative. From reading the Gotland county evaluation, one would also come to the conclusion that this was specifically done for in house consumption on the impact of exhibits on visitors.

1.8 Acknowledgements

The author would like to thank Catherine Aldridge on behalf of At-Bristol for making this evaluation possible by allowing me to work as one of their first interns.

Many thanks to Valerie Collins for the support and guidance she provided during the three months of internship. Regardless of her tight schedule she always made it possible to hold meetings and provide encouragement. Ms Collins was also helpful in correcting grammar on my thesis and has also said that the thesis is a brilliant piece of work and is a brilliant piece of
work and that they will also use the recommendations when they build the next version of sports exhibition.

I would also like to thank Professor Lars Broman for his support and guidance. Regardless of his busy schedule of supervising many students, he was still able to give me his undivided attention.

Thanks to Bob Vincent of At-Bristol for his tutoring lessons on Excel. Per Broman lecturer at Högskolan Dalarna for being available all the time to offer professional help.

Many thanks to Jan Ryegärd of Gotland County in Sweden for having seen it fit to provide me with the research results of their Sports Exhibition. Despite numerous efforts to get other evaluations from science centres around the world with sports exhibits, the only response was from the Gotland County Museum.

The author’s appreciation also goes to Karin Lundburg for companionship during the field work and assisting with the English translation of the evaluation results from Gotland County that were written in Swedish.

Last but not least I would like to thank my husband Seitei Seitei and my lovely kids Tshiamo and Lebo for their moral support. My stay away from home could not have been possible without your support. You are my inspiration.
2. Methods

In order to develop the framework, research was required beyond evaluating the Sportastic exhibition on a front-end basis. Sportastic has been used as the front-end work to evaluate the final larger travelling sports exhibition. Why front-end evaluation? This was considered based on information from the Internet on ‘Evaluating Interpretation’. It has it that front-end is able to answer questions as to how much the audience already know about the topic in question and what they are mostly interested in, so as to enable exhibition developers to tailor their interpretations to their visitor’s knowledge.

The methods were also chosen based on literature reviews by Judith Bell (1999), Lars Broman (2004) Robert K Yin (1994), and Judy Diamond (1999). Literature by these researchers was purely based on quantitative and qualitative methods of evaluation, questionnaire guidelines, presenting and analysing data, literature review and so on. The author was also inspired by Francesca Conti (2000) summative evaluation of first floor exhibits at At-Bristol.

Three methods were chosen to evaluate Sportastic exhibition. Factors that influenced the choice of the methods were budget and time available to conduct the evaluation.

The first method was observational analysis. For example, observing how visitors interact with exhibits, emotional outcomes by visitors created from interaction with exhibits and the amount of time visitors take at individual exhibits. Characteristics of factors on what constitutes a successful exhibit by Ellis Burcaw (1997) and by the British Interactive Group (BIG) as stated on the Internet, were some of the aspects taken into consideration when doing observational studies. This will be discussed further on chapter 5.

The second method was to administer an exit questionnaire so as to drill further into visitor behaviour. This method allowed us to address other concerns regarding the exhibits – from what the visitors enjoyed most and to establish which exhibits were problematic. Also, controversially, whether visitors thought they had learned something by interacting with exhibits and what they would like to see improved within the next iteration – the travelling exhibition. The questionnaire captured open-ended and close-ended questions.

The questionnaire was also conducted in order to get a broad range of information and opinions from the visitors. Questions were drafted and approved by At-Bristol and the local supervisors before they were administered. To check the effectiveness and comprehensiveness of the questions by visitors, a demonstrational survey was conducted with ten visitors after which certain questions had to be rephrased and improved. The questionnaire was specifically targeted to At-Bristol general visitors comprising of professionals, children, unemployed and the retired.

Upon entering the exhibition floor, the visitors were tracked to see how they interacted with the exhibits and asked to complete the questionnaire upon exiting the exhibition floor. (For questionnaire, please see appendix A). Visitors were made aware that they were not required to fill out the questionnaire and that they were free to withdraw from filling the questionnaire whenever they wanted. Visitors were also given the opportunity to fill out the questionnaire
without the interviewer’s interference in order not to influence their thinking when attending to the questionnaire. This was noted.

Permission was sought from guardians, parents or teachers accompanying children before administering the questionnaire to children. The questionnaire was administered from Monday 30 May to Sunday 6 June 2004 and was administered both morning and afternoon.

There were problems noted in filling out the questionnaire. Some visitors did not answer certain questions while certain visitors agreed to fill out the questionnaire only to throw it in the bin or leave it uncompleted by the visitor rest area.

The issue of time factor mentioned above meant that the questionnaire could not be sent to visitors within three or six months after the visit and as matter of fact had to be completed when visitors exit the exhibition space.

In addition to the questionnaire, unstructured dialogue was conducted with staff members particularly the explainers to give their comments on what they think about the exhibits. For example whether they are able to achieve what they have set out to achieve and their personal opinion on visitor’s interaction with the exhibits. Their comments were noted and are included in this report on Chapter 3.

Science of Sports exhibition at the National Science Museum in London was visited in order to be able to compare the two in terms of the aesthetics of the exhibits which could somehow give information on how Sportastic could be improved and be expanded into a travelling exhibition.

On the other hand, comments from visitors on the current topic within Sportastic were gathered from the “Have your Say” space. The topic was “**Is sports becoming more about technology than talent? Does this give an unfair advantage to those with more money than sport**”? For comments please go to appendix B.
3. Observations

The reason behind conducting observations was to assess how visitors use the exhibits within Sportastic and how this would compliment the questionnaire survey. Visitors were assessed on how much time they spent on individual exhibits, how they interact with the exhibits, whether there is communication between visitors stimulated from their interaction with the exhibits, whether visitors were able to read labels or not and which exhibits are mostly and least used by visitors, and maintenance of exhibits.

During observational study, 315 visitors were observed. Majority of visitors came in groups meaning that the total number of groups observed was 67 and additional 5 visitors regarded as individuals.

Since it was difficult to follow visitors around the exhibition floor during the observations, visitors were observed during their interaction with individual exhibits as outlined below.

3.1 Sprint Challenge/Running Track

Almost all sports activities have an amount of running involved whether it’s football, basketball, tennis, cricket, volleyball and so on. But then what has to be borne in mind is the fact that the muscles that affect us while we are running are the skeletal muscles. This is according to the information from the Internet. The information goes on to say:

“These muscles adapt to exercise in special ways. When a person runs for long periods of time each day, these muscles increase their ability to produce energy to keep up muscular work. Working out on a regular basis will strengthen them”.

*Figure 1: Computer interactive screen is before the start line behind the boy, just outside the photo. It acts as the start button. The blue boxes are the sensors, at the start and finish lines.*
3.1.2 Main message

Visitors are invited to test how quickly they react to a starting gun and compare how long it can take them to run over a 10 metre running track and compare their time with that of professional athletes over 100 metres.

3.1.3 Interaction between visitors stimulated by the exhibit

A total of about 48 visitors were observed and were in groups of about 13 comprising both males and females, either family groups or friends. The maximum time spent on the exhibit was 9 minutes with a medium time of 5 minutes and a minimum time of 1 minute. Observation of whether visitors read captions or labels was never made since for this particular exhibit there is no written caption but an audio caption.

From observations made, regardless of whether visitors came together or not, they are always keen to watch the one who is interacting with the exhibit. Communication amongst visitors has also been observed to take place. For example visitors would tell others that they can run faster than the other. As a matter of fact they will compete against time and against each other.

Visitors have also been observed to help each other operate the exhibit or the interactive touch screen. Those who came in the middle of the interaction process would observe what is being done and then copy what others are doing.

3.1.4 Interaction with the exhibit

The exhibit, with its audio labelling is easy to operate by following simple instructions regardless of age, education or social background. The visitor runs on a track of about 10 metres and refers back to the touch screen to see how much they can run. They have the opportunity to compare their time with that of their group members, age mates, top athletes in the 100 metre and the fastest time recorded in 2004. The exhibit is equipped with two sensors - one at the start line to trigger the timer and the other at the finish line to stop the timer.

The visitor then has an option to press the next touch button to see how long it will take them to run 100 metres. Visitors of all ages from 5 years of age upwards are able to press the touch screen for the person who is to race on the track. Children under 5 years old of age would normally ask their parents to lift them up so that they can be able to have their hands-on interaction with the start button on the touch screen.

3.1.5 Emotional outcomes

Visitors were observed to give applause to other visitors who completed the track regardless of the time taken, especially the younger ones, below the age of eighteen, who would always want to try again to see if they will do better than before.
Visitors are also able to echo with the audio label when another visitor finishes on the track. For example, they could be heard saying “eeeeee” followed by clapping of hands and words such as “well done”. This kind of behaviour is also described in the article “Evaluating Interpretations” that talk about the fact that when conducting observations, among the things to look out for is “to observe whether visitors repeat any contents of the exhibit out loud called a ‘text echo’.

3.1.6 Maintenance

The exhibit needs to be checked regularly and have its memory upgraded or it would stop working. For example, it would keep on echoing words such as “false start” at the touch of the button or sometimes the exhibit fails to stop after the visitor has finished going down the track.

3.1.7 Explainers Comments

Positive Aspects

? Visitors seems to enjoy the exhibit most since they compete against clock, self, and friends
? Majority of explainers are comfortable in explaining it.
? The exhibit has proved to be the most popular on the floor.
? Easy for all ages and groups to interact with.
? The exhibit gives visitors an opportunity to race against time, compare their time with that of other group members or other visitors and top score of 2004.
? Visitors seem to stay for a longer period of time interacting with the exhibit.

Aspects that need Improvements

? Currently gives information on possible time for 100m. It would be more relevant if it can give information on other running distances.
? It is not so clear how the calculations are made.
? Average not so good since it is used for physical running and wheelchairs. This needs to be separated to suit the exact time on physical running and the use of wheelchairs.
? It is necessary to have separate runway for physical running and wheelchairs.
? Programming upgrade required since on certain instances the sensors don’t work properly.
? Need information on how wheelchairs could be used.
? Visitors keep on cheating the system to record the fastest score and it is difficult to stop that.
? Visitors do not seem to understand that the exhibit is a one way track.
? Only one serious injury has been recorded.
? The exhibit needs enough space between the finish point and the wall to minimise injuries. Relocation of the exhibit is necessary
? Visitors want to be pushing each other on the wheelchair along the track.
? The exhibit needs padding on the corners and edges of the runway to minimise injuries.
3.2 Virtual Volleyball

Figure 2: Visitors interact with the exhibit by hitting the ‘virtual’ ball from the screen

3.2.1 Description of science behind the exhibit

This exhibit explores ‘green screen’ technology found in movies and newscasts where actors can be placed in imaginary situations. For example, dangling off a cliff, flying through the air or landing on a deserted island. In Virtual Volleyball, guests step in front of a green screen to be digitised into a virtual game. By watching the monitors, players work together to keep the volleyball in the air. Stadium seats let fans sit and cheer.

3.2.2 Main Message

To provide an up-to-date link to what is happening in the world of sports. To give visitors the chance to relax and enjoy some Internet and multi-user sporting games.

3.2.3 Interaction between visitors stimulated from the exhibit

In total about 49 visitors have been observed. The visitors were in groups of about 8 comprising males and females. The maximum time spent on the exhibit was 6 minutes with a medium time of 4 minutes and a minimum time of 3 minutes.

Visitors were observed not to have read the caption. The conclusion made was the fact that the caption was behind the exhibit where there is no action at all. Maybe if the caption was in front it could be easily seen by some visitors who might be interested in reading it.
Visitors always interact with each other on this exhibit. They seem to be fascinated by the fact that they are able to see themselves on the screen. This is supposed to be a two team exhibit but in many cases you find that there are about eight visitors or more interacting with the exhibit. They all try to have a go at the ball at the same time. They laugh and shout at each other to hit the ball. The winning team leaves the exhibit quite happy with their achievement.

Some visitors were observed to be fascinated by the fact that they are able to see themselves on the virtual screen. Certain visitors were also observed not to be interested in actually hitting the ball but in doing other things on the screen. For example throwing themselves on the floor, touching their heads and moving from one place to the other at the same time giggling and laughing. Visitor age did not seem to be a factor.

3.2.4 Interaction with the exhibit

The exhibit is responsive in that it switches and lights up as the visitor approaches. It is an interactive exhibit in that it provides intellectual as well as physical action and gives feedback at the end in terms of the results or score. The exhibit also attracts a variety of users from young children to adults.

Visitors interact to determine their reaction time by hitting the ball from the screen. There is no need for visitors to touch any buttons in order to start the game. At the end of the game the exhibit gives feedback in terms of who has won and who is out of the game.

3.2.5 Emotional outcomes

The exhibit portrays positive emotional outcomes from visitor’s point of view in that the team that has won would be shouting with excitement. The team that lost would want to have another go so that they can also win the game. The applause from the exhibit seems to give a rewarding experience on the part of the visitors and more so that it also gives them their score.

3.2.6 Maintenance

From the three months that the exhibit has been monitored, it has proved to be an exhibit that requires minimal or no regular maintenance. The exhibit shows black spots on the sides, when hit by the ball; these are picked up as people. The problem needs to be rectified.

3.2.7 Explainers Comments

Positive Aspects

- No injuries have been recorded so far since the inception of Sportastic.
- Its location is ideal.
- It is the best in that it is different in terms of the technology used on the exhibit for example, portrays virtual reality.
It is more scientific and shows that computers are becoming more of interactivity in science centres.

Gives visitors a feel of how computers can be integrated into sports and virtual reality.

It gives visitors good exercise.

It is suitable for all ages.

Always in good working condition.

Instructions/ rules not necessary.

It seems to be one of the most popular exhibits amongst the visitors.

Being on all the time encourages visitors to use it.

Huge groups all the time comprising families, friends and school groups interacting with the exhibit.

**Aspects that need Improvements**

Labelling needs to be clearly stated.

Needs information on how virtual reality technology works.

Games are very short. It would be ideal to add more play time.

It needs to be properly adjusted to rectify errors of black spots on the sides because when hit by a ball they treat is as a person.

Needs a line to guide visitors where they have to stand to avoid them pushing closer to the screen.

A bigger screen would be ideal.
3.3 Shooting Hoops/Basketball

![Image](image_url)

*Figure 3: The exhibit allows both physical and wheelchair interactions. The touch screen is situated in the wooden box.*

3.3.1 Description of science behind the exhibit

According to the information from the Internet on the Physics of Basketball,

A basketball player knows instinctively what to do in any given situation. Through thousands of hours of practice and game play, his brain has the correct sequence of muscle movements 'hard-wired' into it, much like you or I can walk without thinking about where to move the legs, and by how much. This is called 'kinaesthetic memory'. A good pro basketball player has these games play reflexes because he began learning the moves as a child, when the brain is most receptive to imprinting a reflexive behaviour. It can be argued that such imprinting, through constant practice, must begin in childhood if the athlete is to become a star pro player.

The question therefore is how did Michael Jordan the famous basketball ball player do it? How did he float through the air with ease? How did he seem to defy the laws of probability with his game winning final-second shots? How did he make his shots from every point on the floor? The answer is physics. The ability to play basketball takes lots of talent and practice; therefore the game can be improved by using the laws of physics.
3.3.2 Main Message

Visitors are to test themselves - how many hoops they can get in 30 seconds and to also try this challenge on a wheelchair.

3.3.3 Interaction between visitors stimulated from the exhibit

About 41 visitors have been observed. Visitors were in groups of about 13 comprising both males and females as family groups or friends. The maximum time spent on this exhibit was 6 minutes with a medium time of 4 minutes and a minimum time of 1 minute. Observation of whether visitors read captions or labels was never made since for this particular exhibit there is no written caption but audio.

Groups of visitors normally interact with the exhibit at a time. For example, in most cases there are more than two visitors at a time interacting with the exhibit when in actual fact it was made in such a way that it should be a one visitor experience regardless of whether they are interacting with the wheelchair or not.

3.3.4 Interaction with the exhibit

The visitor has to get the ball, press play on the interactive touch screen and wait for a countdown from five to zero and then the sound will say ‘play’. The visitor then has to start scoring the baskets into the ring for a period of 30 seconds.

The visitors score has to be compared with top score of 2004 in which up to 84 baskets were scored. The visitor has the option to touch the ‘next’ button which will then give more information on scoring points and which basketball personality scored more goals in the 1960’s.

From observation, the average score of the day is normally five baskets. Through interacting with the touch screen, visitors are able to follow the instructions. Visitors are also supposed to try the challenge of scoring the baskets from a wheelchair to see how their score compares with their physical scores.

3.3.5 Emotional outcomes

As soon as the sound from the touch screen tells the visitor that the game is over, they would normally look at how their score has compared. In certain instances they would have another go at the exhibit. If it is a group of people interacting, they would all want to go for the ball and score the basket. Whoever is able to attain the score would shout “Oh I made it” or “I am good at this really”.

Visitors going for individual experience would always try it once more to ascertain whether they will be able to score more hoops than before or if they will beat their friends or relatives with more scores.
3.3.6 Maintenance

The exhibit requires minimal maintenance.

3.3.7 Explainers Comments

Positive Aspects

? It is simple to operate, self explanatory and more fun.
? It is suitable for both genders.
? Gives actual facts about the sport.
? It brings an element of interaction between visitors.
? Guides are more comfortable explaining it to visitors.
? There is enough space to manoeuvre.
? Encourages active participation.

Aspects that need Improvements

? Visitors get to score from underneath the ring in order to alter the score.
? Visitors have a tendency to use it as netball.
? Descriptions are not very clear to most visitors.
? At times it is unreliable on registering scores. For example, would record the score twice or when the ball bounces on the ring.
? Can be dangerous when visitors try to balance on the ring.
3.4 Hot Shots/Football

![Image](image.png)

*Figure 4: The computer interactive screen is not visible on the picture. It is situated on the left corner behind the visitors.*

### 3.4.1 Description of science behind the exhibit

According to information provided on the caption, the scientific background is to see how testosterone alters the performance of footballers and animals. The caption also says that scientists suggest it may encourage assertiveness and improve reaction time, spatial ability and the metabolic rate of muscles.

From the caption, it is reported that research done in Northumbria University has shown that football players have increased levels of testosterone before a home game. Goalkeepers are also said to have showed the biggest rise in testosterone levels. Levels of this hormone are said to rise in some animals like cheetahs, lions and so on when their home turf is being invaded.

### 3.4.2 Main Message

How accurate can you kick the ball and how do you compare to other visitors and professionals.
3.4.3 Interaction between visitors stimulated from the exhibit

20 visitors have been observed. The visitors were in groups of about 4 and 1 individual comprising males and females. The maximum time spent on this exhibit was 12 minutes with a medium time of 6 minutes and a minimum time of 4 minutes.

The exhibit comprises of written caption and audio labelling. From the observations made the written label was never read. Conclusion was made that since the caption was at the back of the exhibit it could not be easily seen or visitors might have thought that it does not apply to the exhibit.

With this exhibit, visitors are able to exploit all levels of interactivity in that they are able to operate the touch screen and engage in kicking the ball and aiming for a score. Some visitors go to the extent of scoring the ball with their hands. Ideally one person has to kick the ball at a time, but there is always more than one visitor kicking the ball since majority of visitors come in groups. Visitors also engage in dribbling regardless of the fact that the space is too small to engage in that kind of activity.

3.4.4 Interaction with the exhibit

The visitor has to start the game by pressing an interactive touch screen. This then gives the visitor a count down from five down to one and tells the visitor to play. The visitor then has to start kicking the ball and score as many goals as they can within a period of 45 seconds in the holes provided.

The exhibit has four different holes and each hole carries different points ranging from 10 to 40. The results are then compared with the fastest score recorded in 2004. As soon as the time is over the visitors are able to see their score before the interactive screen resets itself to give the next visitor an opportunity to press the start button.

3.4.5 Emotional outcomes

Children in particular enjoy the opportunity to explore the system together with their peers or parents. This happens regardless of the accompanying adult’s or friend’s football skills. Majority of visitors that interact with this exhibit, instead of going for hot shorts, they play football like they are in the field, for example employing the dribbling techniques. Some visitors try to cheat the system by putting their hands inside the hoops where the sensors are placed in order to achieve a much higher score.

3.4.6 Maintenance

The exhibit needs minimal maintenance.
3.4.7 Explainers Comments

Positive Aspects

- The exhibit is fun since everybody likes football and it is also a national sport.
- The exhibit is a good challenge since it is not easy to score.
- Encourages visitors particularly kids to be more active.

Aspects that need Improvements

- Interactive screen is hard to follow from visitor’s point of view.
- The exhibit needs information on the points given to each hole and how often each ball gets scored on the different holes.
- Visitors also do not seem to appreciate the fact that the different holes have various values.
- The space is too small. This needs to be enlarged to lessen the impact of the ball when it bounces back from hitting the board where holes are situated.
- Visitors easily cheat the system in order to register a much higher score.
- Need a more reliable score when the ball cuts through the holes.
- No appreciation from the visitors that this is a single team game or challenge. Always group of visitors interact with the exhibit at the same time and one trying to be the goalie while others are dribbling.
- Does not exploit the skills of the visitors.
- Some visitors score the ball with their hands instead of kicking it.

3.5 Skeleton Bob

Figure 5: Visitor lying down on the sled to watch the film.
3.5.1 Description of science behind the exhibit

The skeleton sled is steered by shifting the body’s weight and stopped by the uphill finishing. Aerodynamics, friction studies and control dynamics are used to create a world class sled.

3.5.2 Main Message

To show an amazing bit of video of a local Olympian – to make the user feel like they are really part of the experience.

3.5.3 Interaction between visitors stimulated from the exhibit

About 14 visitors have been observed. The visitors were in 4 different groups and an individual both males and females. The maximum time spent on this exhibit alone was 4 minutes and a minimum time of 19 seconds.

Only one person can concentrate on the exhibit at a time. Normally other group members would stand back and wait for their turn. Some visitors would ask the one interacting with the exhibit what they see and how it feels? It has been observed that this is the only exhibit appreciated by visitors as a single team experience.

3.5.4 Interaction with the exhibit

Visitors explore their sense of vision by looking through the film. What they have to do is to lie down, watch the film in order to find out what it feels like to hurtle headfirst down on an ice canal at over 135km per an hour.

3.5.5 Emotional outcomes

Visitors watching the one interacting with the exhibit are always anxious to know what he or she sees and would also have a go at the exhibit in order to get their own experience. Sometimes one would hear comments such as “awww” or “oh it is very scary down here”

3.5.6 Maintenance

Needs minimal maintenance
3.5.7 Explainers Comments

Positive Aspects

? It is a good idea in that it is different and gives visitors a feel of how it is like to go on the skeleton bob.
? Camera and footage gives a realistic view of going on the skeleton bob.
? The exhibit is robust in that it does not break easily.

Aspects that Need Improvements

? The platform that visitors lie on does not feel real and comfortable. Lying surface with movement will give visitors a real feeling of skeleton bob.
? The exhibit could be made more interactive by controlling the motions and body weight instead of just watching the film.
? The journey needs to be timed so that visitors can have beginning and the end of the journey or alternatively be equipped with a reset button.
? The exhibit could do with more information since majorities of visitors are not aware that they have to lie down on the platform in order to get closer to the video.

3.6 Meet the Expert (Cabinet, notice-board, case Description)

3.6.1 Main Message

This observer was not present at ‘Meet the expert’ sessions therefore cannot comment on the evaluation of this segment.

3.6.2 Interaction between visitors stimulated from the exhibit

The author was not present at ‘Meet the expert’ sessions therefore cannot comment on the evaluation of this segment.

3.6.3 Interaction with the exhibit

Interaction with the experts has not been noted

3.6.4 Emotional outcomes

No emotional outcomes observed.

3.6.5 Maintenance

No maintenance required except to ensure that the space is wholly used for what is supposed to be used for.
3.7 Large Presentation/Lunch Space/Live Screening

3.7.1 Main Message

A space where public shows and displays can be hosted. This space can also be used to back up Meet the Expert sessions, screen live sports and double as lunch space.

3.7.2 Interaction between visitors stimulated from the exhibit

People talk together while they have their lunch or resting about some of the exhibits that they interacted with. Since the space is next to ‘test your reaction’ exhibit, normally the visitors resting would be watching those that are interacting with this exhibit. Visitors also interact and communicate with each other particularly during the ‘60 second’s circus’ and ‘from past times to fast times’ presentations.

3.7.3 Interaction with the exhibit

Visitors can either take part in some interactive shows such as from fast times to past times, 60 seconds circus or supposed to meet with the expert on a particular sporting field.

3.7.4 Emotional outcomes

During the show from fast times to past times visitors always listen attentively to the information presented. They are also able to cheer and clap their hands to the visitor’s interacting with the presentation balls alongside with the presenter.

During the 60 seconds circus they are all keen to know how to balance peacock feathers on their fingers, nose and chin, to spin the plates, hula-hoops, juggling, diabolo and other activities. They express their satisfaction when they have been able to achieve the balancing or the spinning of the plates and so on.

3.7.5 Maintenance

Minimal maintenance is required.

3.7.6 Explainers Comments

*Positive Aspects*
Good idea that snacks and beverages are within reach of visitors on the floor.

**Aspects that Need Improvements**

- Information on the benefits of healthy eating needed.
- The refrigerators should be stocked with various foodstuffs so that visitors can be able to choose between healthy and junk food.
- The choice of food within Sportastic contradicts the notion of encouraging visitors to lead active and healthy lifestyles.

### 3.8 Have Your Say

#### 3.8.1 Description

This is a notice board where people can independently post their opinions about the current issue.

#### 3.8.2 Main Message

An area where visitors have the opportunity to say what they think about a certain issue in sport. The current topical issue is “Is sports becoming more about technology than talent? Does this give an unfair advantage to those with more money than sports?”

From the comment board, a total of 64 comments were collected. 48 visitors gave positive comments, while only 13 comments were irrelevant and only 3 people said that they do not have any idea. *(Please see Appendix A).*

#### 3.8.3 Interaction between visitors stimulated from the exhibit:

There is supposed to be no interaction between visitors since this call for an uninfluenced personal view. Few visitors observed though would normally write their opinions collectively.

#### 3.8.4 Interaction with the exhibit

People are able to write comments at their own free will and compare their viewpoints with those of other visitors. The idea of this space is to spark debate amongst visitors.

#### 3.8.5 Emotional outcomes

Everybody put down their opinions on what they feel or think about the question posed. Majority of the visitors respond to the question satisfactorily.
3.8.6 Maintenance

The space needs regular maintenance by making sure that there is enough space for visitors to post in their comments. This can either be by removing some of the notes for safe keeping and ensuring that pens and papers are always provided for visitors to post their comments.

3.9 Java Café

![Java Café](image)

*Figure 6: Computers are accessed through the use of a joy-stick. The space is also used as a rest area.*

3.9.1 Description

These are computer screens where visitors can surf the internet on different sports issues or information.

3.9.2 Main Message

To provide an up-to-date link on what is happening in the world of sports and to give visitors the chance to relax and enjoy some Internet and multi-user sporting games.

3.9.3 Interaction between visitors stimulated from the exhibit

27 visitors have been observed. The visitors were in groups of about 5 both males and females. The maximum time spent on the computers was 17 minutes with a medium time of 6 minutes and a minimum time of 4 minutes.

Group of visitors could normally be observed communicating with each other from one screen and sharing information. This among other things provides information on mini golf, BBC sports Academy, kid’s sports, exploratorium and so on. Visitors are provided with cushioned benches so that they can all group or sit comfortably around the screen.
3.9.4 Interaction with the exhibit

The exhibit allows only one person at a time to have hands-on with joystick at a time. If the computers are fully occupied or engaged visitors from one group would wait to interact with the exhibit. The space can also be used as a rest area.

3.9.5 Emotional outcomes

Visitors have been observed to search with a lot of interest and show passion to what they do or are looking for. They flick through all the options to find out what is contained inside, while other group members look through to see what happens on the screen. From the observation some visitors use the computers to just browse while there are those who look for specific information. Children more especially have been observed to move from one screen to the other to see if there is something different on other screens as well.

3.9.6 Maintenance

The computers need to be checked on daily basis.

3.9.7 Explainers Comments

*Positive Aspects*

– Lots of things to do on them.
– Visitors are able to catch up on their favourite sports.
– Some of the Websites are interactive making them popular with kids
– Idea of two separate tables equipped with computers is good.
– Majority of visitors enjoy the programmes.
– Allows visitors to rest and explore.

*Aspects that Need Improvements*

– Information based Websites are popular with kids since they want interactivity
– Most visitors use the cushioned benches as rest area.
– The computers need pop-up blocker to stop unwanted windows showing on the screen.
– Most of the information should be linked to exhibits available on the floor.
3.10 Batak (Test your reaction)

Figure 7: Visitor pressing the LED to test his reaction

3.10.1 Description of science behind the exhibit

The exhibit basically tests visitors lighting reactions. The challenge is reported to be used in training top athletes with an unofficial world record being 114 hits in 60 seconds. From the caption, it is said that in laboratory tests, no one has recorded a reaction time faster than 0.1 seconds. A time faster than this is said to be due to anticipation, not reaction.

The caption also thus read,

It takes the body about 0.16 seconds to react to a sound stimulus such as the pistol in a race. A start time faster than 0.1 seconds will not be allowed. You need to send nerve impulses from your eyes to your brain and then to your hand and that takes time.
3.10.2 Main Message

The exhibit provides visitors with an opportunity to test their reaction and hand-eye co-ordinations. Visitors have to do is to press the start button and touch the LED lights as they appear on all sides of the exhibit. The exhibit automatically stops after 30 seconds at which the visitor has to check how many LED lights has been hit.

3.10.3 Interaction between visitors stimulated from the exhibit

In total about 36 visitors have been observed. The visitors were in 11 groups both males and females. The maximum time spent on the exhibit was 8 minutes with a medium time of 4 minutes and a minimum time of 2 minutes. The exhibit comprises a written caption and an audio label that tells the visitor to start after pressing the start button. From the observations made the written label was read by only two of the visitors. It is advisable to have the caption within the exhibit for ease access.

Visitors’ interactions with each other and/or with the exhibit are encouraged by using hands-on settings. This also encourages co-operation, communication and discussion with other visitors. For example, spectators could be heard shouting at the person interacting with the exhibit telling him/her where the light is. Whether she/he must look at the top/bottom left, top/bottom right or top/bottom centre.

Parents are also able to help younger children to either press the top lights for them or lift them up so that they can press the lights themselves. If one of the family members is reluctant to interact, normally other family members would encourage them to have a go. In most cases spectators go to extend of pressing the button resulting in more than one person interacting with the exhibit at a time. In most cases one would be pressing the LED lights on the left while the other visitor operates the lights on the right hand side.

3.10.4 Interaction with the exhibit

The exhibit basically lets the visitor use their hands and mind to test how their lightning reaction compares. For example, visitors are to start the exhibit by pressing the start button followed by pressing all the LED lights shown on the exhibit as fast as they can. This is done within a period of 30 seconds. The exhibit also has about 24 programmes, but all these have not been exploited by visitors yet.

3.10.5 Emotional outcomes

The one who had scored more than the other group or family members’ shouts that he/she is the winner. This is normally when the ones who had scored less than the other would go for another chance. Should the exhibit stop working during the process of interaction, visitors get disappointed and will keep on checking whether the fault has been rectified before leaving the exhibition floor.
3.10.6 Maintenance

The exhibit requires regular maintenance since it sometimes stops functioning.

3.10.7 Explainers Comments

Positive Aspects

- It is fun in that it tests reaction time of visitors.
- It gives visitors an aerobic exercise.
- Sharpens visitor’s awareness and with practice it can sharpen reaction time.

Aspects that Need Improvements

- Need clear signage as to where the start button is situated.
- Some visitors never know when the game is finished. It will therefore need a clear signal.
- At times it does not work properly. Keeps on breaking.
- Visitors need to know how much they need their peripheral vision.
- Need information on the science of sport and to tell visitors what they are achieving by engaging with the exhibit.
- The exhibit has to have only one person engaging with it at a time, but most of the time there is more than two people interacting with it.
- More improvements will be based on what visitors want to achieve
- Disadvantages shorter people.
- Visitors should be given an opportunity to exploit the twenty-four programmes available on the exhibit.

3.11 Skateboard Challenge

3.11.1 Description of science behind the exhibit

The visitor has to balance on the skateboard and hold the handlebars and let go of the start timer.

According to the caption provided, the skaters, surfers and snowboarders all skilfully change their centre of gravity to command and control their boards. While skateboarders seem to defy the laws of physics, they are in fact exploiting them. By subtle and skilful movement of arms, legs and feet, skaters can change their centre of gravity to achieve perfect balance.

A force is needed to start or stop something moving. Without doing any calculations, skaters expertly manipulate forces to perform breathtaking acrobatics.
3.11.2 Main Message

Test your balance by timing how long you can balance a skateboard and compare this with professional skaters.

![Image](image_url)

Figure 8: Family or group members looking on and communicating about interaction with the skateboard exhibit.

3.11.3 Interaction between visitors stimulated from the exhibit

In total about 31 visitors have been observed. The visitors were in groups of about 9 and only 1 individual. These groups were comprised of both males and females. The maximum time spent on the exhibit was 3 minutes with a medium time of 2 minutes and a minimum time of 10 seconds. The exhibit has a written caption only. From the observations made only 3 visitors who could not get the exhibit to work, read out the caption for instructions.

Visitors' interaction with each other or with the exhibit is encouraged by using hands-on settings that encourages co-operation, communication and discussion with other visitors. The parents are able to explain to their children what to do in order to achieve balance.
3.11.4 Interaction with the exhibit

Visitors test their sense of balance. The visitor presses the button to start the timer. One has to balance on the skateboard by holding the handles at the top of the skateboard. Once the visitor achieves their balance the timer stops. When the skateboard is no longer horizontal.

3.11.5 Emotional outcomes

Visitors who are able to balance are pleased with themselves while those who cannot always have another go to see if they will get it right the second time.

3.11.6 Maintenance

The exhibit requires routine maintenance as it breaks quite often.

3.11.7 Explainers Comments

Positive Aspects

? The difficulty in achieving the balance is quite a challenge.

Aspects that Need Improvements

? Visitors spend very little time in interacting with it.
? The balancing time does not seem real.
? Needs an easier and more reliable way of starting the exhibit.
? Quite flexible for kids to interact with, needs to be a bit stiffer.
? Can be dangerous in that it is wobbly and visitors can easily fall off.
? Does not give a feel of a real skateboard.
? Visitors are always frustrated by the way it works.
? Handles do not seem to work most of the time. When you let go it does not perform.
? Digits do not always work.

3.12 Test Your Pulse

3.12.1 Description of science behind the exhibit

Our hearts pumps blood around the body. Blood provides muscles with oxygen and nutrients. It also removes waste products and the heat produced during exercise. As we become more active, our muscles need more oxygen and nutrients. Our hearts have to work harder to supply this, so our pulse rate rises.

The pulse of a baby at rest is said to be 120 to 160 beats per minute. A 12 year old at rest will get 70 to 80 beats per minute, while an adult at rest will get a pulse of 60 to 90 beats per
minute. The heart will also beat about 2.8 billion times in a typical lifetime. During that time the heart will also pump enough blood to fill about 200 large swimming pools each 50 metres wide and 2 metres deep.

3.12.2 Main Message

Visitors are to find out what their pulse is and how it changes according to their activity levels.

3.12.3 Interaction between visitors stimulated from the exhibit

In total about 11 visitors have been observed. The visitors were in 3 groups and 1 individual both males and females. Maximum time spent on the exhibit was 4 minutes with a medium time of 1 minutes and a minimum time of 19 seconds. The exhibit comprises of a written caption only. 5 visitors were observed to have read the caption to compare their results with that of their age mates or the table of average provided.

Visitors are always keen to see how their results compare with those of their group members or friends. The visitor who got a low result would always want to have another go to see if his result will compare better than the previous. The visitor who compared better than the others boasts that he is healthier than his colleagues.

3.12.4 Interaction with the exhibit

Visitors have to squeeze the handles as hard as they can and compare the result with the table of average provided. This will then give the visitor information as regards to how their pulse compares with others of their age and gender. The exhibit allows the visitor to take the aerobic pulse and the resting pulse.

3.12.5 Emotional outcomes

Visitors seem to be happy to know how their pulse compares with other group members. The one who thinks that he/she has a better pulse rate seems to be pleased that he is the healthiest amongst the group.

3.12.6 Maintenance

The exhibit requires regular maintenance
3.12.7 Explainers Comments

*Positive Aspects*

- Good idea that there is labelling in front of the exhibit where visitors can compare their pulse.

*Aspects that Need Improvements*

- Always breaks down.
- This is quite an old exhibit and as such will need to be replaced with a modern one.
- Some visitors have expressed that they do not trust the reading.
- Visitors do not seem to realise that they need to relax when engaging with the exhibit and that they will get a higher pulse rate when they have been active.
- Need more information on the fact that if you have been active, stressed, diabetic, suffered heart attack before and so on, the reading will be altered.

3.13 Mini Sports Arena

*Figure 9: An under 6 year’s old of age area. Kids have to be supervised by explainers or parents.*

3.13.1 Description of science behind the exhibit

For science behind the exhibit please refer to the sprint challenge. This is an area for children aged 6 years old and below. The idea of providing them with such a facility was to ensure that children this age do not feel left out and that they have not been catered for. The area is provided with tricycles, space hoppers and competes in races such as egg and spoon, skipping, sack, bean bag and also throwing of the javelin.
3.13.2 Main Message

To get children 6 years of age and under to engage in sports and create their own games using various objects.

3.13.3 Interaction between visitors stimulated from the exhibit

A total of about 8 different visitors have been observed. The children were accompanied by their parents or guardians. The time spent on this exhibit alone was 45 minutes since there were different shows that were done at a time as mentioned under the description above.

The exhibit comprises a warning label that says the space is for children less than 6 years of age. From the observations made this label is however never read by those that are over the age limit since most of the visitors including adults are normally seen on the space hoppers and the tricycles. The other reason might be that the labelling is not at eye level to enable it to be easily noticed by visitors.

Children are able to race with each other with the tricycles and the space hoppers. They always shout at each other in a jubilant mood saying, “I can do this” “I am able to hop and cycle much faster than you”. The arena has also proved to be popular with parents and bigger children who time and again have to be reminded that the section is for kids aged 6 years and under.

3.13.4 Interaction with the exhibit

Kids’ cycle or hop around the arena under close supervision of parents or the explainers. This is to ensure that they are safe all the time. Under 7’s are also able to race against each other on the tricycles, space hoppers, sack, egg and spoon, skipping, relay and bean bag races as well as to practice their skills on throwing the javelin.

3.13.5 Emotional outcomes

Kids are always very pleased with themselves that they have been to cycle or go on the space hoppers.

3.13.6 Maintenance

The exhibit requires minimal maintenance.
3.13.7 Explainers Comments

Positive Aspects

? It is a good idea to have something for less than 6 year old of age so that they are not left out.
? Sports day a good idea in that it gets kids to interact with each other, build their confidence, get worked out and engage in a healthy competition.
? Lots of things to do on sports day resulting in sense of achievement by awarding kids At-Bristol certificates.
? Markings on the ground give room for more interactive and real life situation particularly when doing the races.
? No injuries have been recorded.

Aspects that Need Improvements

? The area seems too small when there is a larger group from schools.
? Elderly visitors always want to interact with the exhibits.
? Need a bigger sign at eye level saying that this is an under six area.
? Explainers and first aides should always be within reach when kids are engaging with exhibits.
? Need to have it presented whenever there is the right age for it.
? The show can only have a maximum of eight kids.
? Skipping race not a good idea because kids can hurt each other in the process.
? Not enough activities for kids when they are not involved on sports day. Balls and nets will be more appropriate as well.
? The positioning is not ideal for kids to engage with the exhibits peacefully and quietly.
? It might be a good idea to increase the age to also cater for 10 year old children. Explainers will however have to ensure that older kids are not overwhelming to younger kids.
? Every explainer should be able to present the show.

3.14 Wheelchairs

3.14.1 Description/Science behind the exhibit

The wheelchairs are meant to make visitors have an understanding of what life is like in a wheelchair and also to give them an opportunity to engage in sporting activities such as sprint challenge and basketball.

3.14.2 Main Message

Visitor will get an idea of the upper body strength and skills required being a wheelchair athlete.
3.14.3 Interaction between visitors stimulated from the exhibit

Visitors have been observed to be pushing each other on the wheelchair. This is not supposed to be the case though as it is meant to be an individual experience.

3.14.4 Interaction with the exhibit

The visitors use the wheelchairs spread around the exhibition floor to move around the exhibition space. They also use these on exhibits such as the sprint challenge and the basketball so as to compare their running time or how many baskets can be scored with or without the wheelchair.

3.14.5 Emotional outcomes

Visitors get thrilled over the fact that they are able to interact with the wheelchair in engaging into activities such as running, playing basketball, and moving around within the exhibition space. Some go to the extent of asking colleagues to push them around within the exhibition space with the wheelchair.

Most of the time visitors would ask if they are allowed to use the wheelchair regardless of not being disabled. Reason for asking might be the fact that there is no caption available to say that these are for all visitors.

3.14.6 Maintenance

The exhibits require minimal maintenance.
3.14.7 Explainers Comments

Positive Aspects

? Good idea because visitors will have an understanding of what wheelchairs users go through and have appreciation of wheelchair users.
? The concept of using wheelchairs on events such as running and basketball is good in testing skills.

Aspects that Need Improvements

? It can be dangerous in that people bang it against each other and other exhibits.
? Most of the time there is more than one person using it at a time. For example, one sitting on top of the other while the third visitor is pushing the wheelchair

3.15 From Fast times to Past times

3.15.1 Description/Science behind the exhibit

Like everything else that societies have invented sports also evolved over time. Some sports died out like the ball games that the Aztec Indians played or the brutal games of the Coliseum of Rome. Other games endure in some form or change slowly. Races have been held since ancient times. This looks at the history of sports in order to provide a social foundation for the study of sports and physics.

3.15.2 Main Message

To make visitors aware of the history of balls and on how ball games evolved from the past to the present.

3.15.3 Interaction between visitors stimulated from the exhibit

In total about 16 visitors have been observed. The visitors were comprised of different groups both males and females. The maximum time spent on this exhibit was 16 minutes. There was no medium or minimum time noted since this is a presentation show scheduled to last for 15 minutes.

The presenter leads the show by taking the audience through out the history of sports particularly ball sports. Visitors, particularly children are randomly picked to answer questions and participate in some of the activities presented.
3.15.4 Interaction with the exhibit

Visitors sit down and listen to the presentation after which they are randomly chosen to participate in any activity that the presenter is leading.

3.15.5 Emotional outcomes

When participating in an event, visitors were observed to be pleased with the fact that they are able to follow instructions from the presenter. Visitors sitting down would be clapping hands and cheering those that are taking part in an activity.

3.15.6 Maintenance

Minimal maintenance is required.

3.15.7 Explainers Comments

Positive Aspects

- The show is quite good with larger crowds since it easy to get them energised.
- Good in that it gives visitors information on the history of balls.
- People are free to join in or leave at will.
- The show always gets keen audiences who are willing to participate and answer questions.

Aspects that Need Improvements

- The show is difficult to present with small groups.
- The open space is quite distracting for the audience; this can do with closed space.
- It is difficult to get people interacting with other exhibits to join the show.
- There is room for experts to come and present the show, but can be hard for experts to come regularly because of finances and time.
3.16 Stinky Shoe

*Figure 11: The glass box has a shoe inside and holes are drilled on the sides for smelling the shoe.*

### 3.16.1 Description of science behind the exhibit

The exhibit has a display of a shoe in a glass casing with few holes on all the four sides where visitors can smell from. The exhibit is supported by a caption that says it is the fat molecules in our sweaty feet that bacteria love. Scientists have found that bacteria digest these fats, just like they do when dairy products go bad and that is why feet can smell cheesy.

The caption goes on to say that trainers are a dream come true for bacteria living on our skin. They feed on our sweat, turning it into smelly waste product. It is reported that two researchers at St. Bartholomew Hospital in London stumbled upon a cure for smelly trainers. They were looking at the body’s own method of dealing with bacteria – nitric oxide.

Nitric oxide kills germs in our stomachs, so the scientists developed a box that mimics these conditions. When trainers are placed in the box and gassed with nitric oxide, the bacteria are destroyed and there will be no more smell.

### 3.16.2 Main Message

The visitor will get an idea of what makes trainers smell and how the smell can be avoided.

### 3.16.3 Interaction between visitors stimulated from the exhibit

About 20 visitors have been observed. The visitors were in groups of 4 and 1 individual both males and females or family groups. The maximum time spent on this exhibit was 12 minutes with a medium time of 6 minutes and a minimum time of 4 minutes.
After smelling the shoe, the visitors would normally talk to each other about the smell, saying that “I don’t like this shoes, it stinks” or say that that “ooh the smell is off putting”. Other group members who had passed the exhibit are normally called back by their group members to come and smell the shoe.

3.16.4 Interaction with the exhibit

The visitors have to interact with the exhibit by placing their nostrils on the holes drilled on the sides of the exhibit. In most cases visitors do not really have to smell the shoe from the holes since the smell is always coming out from within the holes.

3.16.5 Emotional outcomes

“Ooh there is a bit of a stink in there!” or “it stinks!” “Whose shoe is this?” are normally comments heard from those that smells the shoe or passes next to where it is placed

3.16.6 Maintenance

The glass has to be cleaned regularly from finger prints.

3.16.7 Explainers Comments

Positive Aspects

? Good idea to raise awareness on hygiene of trainers.
? People are able to get information as to what causes trainers to stink.

Aspects that Need Improvements

? Should smell like a real stinky feet.
? Need to be relocated since the smell is off-putting at the Java Café area, which is also supposed to be a rest area.
? Not a good idea to smell all the time even to visitors not interacting with it.

3.17 Test Your Grip/Strength

3.17.1 Description/Science behind the exhibit

For all sports we need power comprised of speed as well as strength. This exhibit allows visitors to test the strength of their muscles. The dynamometer tests the strength of the muscles. From the caption, it indicates that strength is the ability of a muscle to apply force and overcome resistance. Depending on the activity, that could be pushing, pulling, lifting or
striking. To improve strength, it is said that one can use resistance training such as lifting weights and that our muscles contract to either achieve movement or stay still.

![Figure 12: One visitor is interacting with the exhibit (test your strength) while the child is looking on.](image)

### 3.17.2 Main Message

Test your strength – one of the four S’s - for sports namely strength, suppleness, speed and stamina. How do you compare to others?

### 3.17.3 Interaction between visitors stimulated from the exhibit

A total of 11 visitors have been observed. The visitors were in groups of about 3 both males and females. The maximum time spent on the exhibit was 5 minutes with a medium time of 4 minutes and a minimum time of 2 minutes. Of the 11 visitors observed, only 3 were noticed to have read the caption. All the visitors were also observed to have compared their strength with those of their age mates from the chart provided.

Visitors always persuade each group member to interact with the exhibit to compare their strength with people his or her age and of the same gender provided on the chart within the exhibit. Visitors who compare better than their age mates and gender go away pleased with
themselves. Group members who are not interacting with the exhibit take a much closer look at what the other member is doing and how their scores compare.

3.17.4 Interaction with the exhibit

The visitor is to squeeze the handle of the dynamometer as hard as they can in order to see how their result compares with the one on the chart based on people their age and gender. After holding on to the exhibit for a short period of time, the visitor waits for the dial to settle down before they can compare their results.

3.17.5 Emotional outcomes

Visitors seem to be happy to know how their pulse compares with other group members. The one who thinks that he/she has a better strength result seems to be pleased and boast that he is the strongest among the group.

3.17.6 Maintenance

The exhibit requires regular maintenance as it breaks quite often.

3.17.7 Explainers Comments

Positive Aspects

- Idea of having such an exhibit is good in that people will get to appreciate that for every activity that one engages in, some strength is needed.
- Concept good in that visitors gets to find out about the strength of their bodies.

Aspects that Need Improvements

- Breaks all the time.
- Visitors grab it with two hands instead of one.
- The referral table does not seem to work quite well.
- Should give visitors an option to know their different variations under different situations. For example, working, resting and so on.
3.18 Beat the Goalie/Hockey

Figure 13: The goalie wearing the protective gear while the other visitors shoot the balls from the morph machine.

3.18.1 Description of science behind the exhibit

According to information from the Internet, hockey is about minimising and accelerating friction. Speed is also part of shooting, especially the slap shot, which can hurl a puck at the net at over 100 miles per an hour.

Part of that energy comes from the transfer of the player’s weight from legs to stick; part of it comes from the stick itself, which hits the ice a foot or more behind the puck and bows as a result. When the blade hits the puck, the bow is released, imparting the energy stored in the bent stick to the puck. There’s also a slight snap of the wrists, which causes the puck to spin; that makes it more stable in flight because spinning objects resist being tipped.

3.18.2 Main Message

To understand how new technology is helping players’ train while experiencing the feeling of being a hockey goalkeeper.
3.18.3 Interaction between visitors stimulated from the exhibit

In total about 15 visitors have been observed. The visitors were in groups of about 15 both males and females. The maximum time spent on the exhibit was 9 minutes with a medium time of 6 minutes and a minimum time of 4 minutes.

The exhibit has a written caption only. From the observations made the written label was never read. Visitors interacting with the exhibit were observed to be mainly children aged 11 years and under. They normally form teams and agree on a score after which the next team will have to defend the balls at the net.

Ideally one person has to be feeding the balls into the morph machine while the other one defends the balls from scoring. But most of the time there are more than two visors feeding the balls in the morph machine.

3.18.4 Interaction with the exhibit

One visitor has to feed the balls into the hockey machines. A friend has to defend the goal. The goalie has to put on a protective head gear and stand between the two poles that have the net attached to them. The opponent has to move the machine in order to change the aim.

The goalie tries to distract the striker by moving early. The striker under huge pressure to score uses imaginary and thought stopping techniques to combat this. When faced with a skilled opponent, a goalie will not have enough time to react, so anticipation is required.

The observation made is that normally the goalie never puts on the protective head gear. The warning caption is also hidden behind the bigger caption and it is also in small letters on an A4 sheet of paper.

3.18.5 Emotional outcomes

The emotional outcome observed is all about cheering and laughing very loudly particularly when the goalie is able to defend a goal or when the ball went through the net.

3.18.6 Maintenance

The exhibit requires regular maintenance since most of the time balls get stuck in the morph machine.

3.18.7 Explainers Comments

Positive Aspects

? Kids enjoy it.
? Has so far been improved since the balls used to jam in the machine.
Aspects that Need Improvements

? Need clear signage-requiring visitors to wear protective clothing particularly the helmet.
? The exhibit requires a net all around to prevent balls from scattering all over the place.
? This is a two-team game but most of the time more than 4 visitors are seen interacting with the game.
? The speed of the ball should be reduced.
? The impact of the ball hitting the goalie (if not putting on protective gear) can have dangerous results.
? Need guiding rules at the rate at which balls can be put in the machine.
? Several children have been hurt when slotting balls in the machine.
? Should be able to be moved to all the sides, not just sideways. For example tilt up and down as well.
? It appears not to be linked too much to hockey but more towards football.
? Visitors seem not to follow instructions since most of the time they lift the machine instead of moving it
? Explainers need to show visitors how to interact with the game in a safe manner.

3.19 Explainers Comments on 60 Seconds Circus

Positive Aspects

? It is good in that there is variety of activities to do.
? Explainers do not feel trapped with explanations since visitors are able to demonstrate to each other their skills and teach others how to do things.
? Visitors are able to exploit other tricks.
? Balancing and co-ordination skills that visitors do can be applied in their everyday lives.

Aspects that Need Improvements

? It will be a good idea to occasionally have an expert on circus skills to lead a session or workshop.
? The show can have more equipment than it currently has.
? Some of the material should be made available for visitors to buy from the shop.

3.20 General Explainers comments on Sportastic Exhibition

? The exhibition is a good idea in that it instils a sense of appreciation on visitors on how hard it is for sportsmen and women to achieve success.
? Sportastic has mostly random exhibits that are not related to each other.
? Table football portrays no skills and does not have anything to do with science. It seems that it has been put there to just feel up space.
? In most cases it is not possible to explain science concepts behind the exhibits because of the excitement of the visitors.
It is crucial to increase the number of explainers on the floor, more especially when there are larger groups.

While it is good that the exhibition attracts different ages, it is important to define the preferred target group.

Need clear signage at the entrance welcoming visitors to Sportastic.

Labelling and signage on individual exhibits need improvements.

Need phone on the floor to enable ease of communication with first aides in cases of accidents.

Since injuries are mostly associated with sports, information on minimising injuries in each sporting event is necessary.

3.21 General Observation on Sportastic

Visitors at Sportastic seem to maintain a kind of interaction. They also seem not to be bothered about the fact that other visitors are watching them when interacting with the exhibits. A larger percentage of visitors are able to get hands on and body on experience with most of the exhibits. For example virtual volleyball, shoot the goalie, sprint challenge, test your reaction and so on. Visitors are also able to learn how the exhibit works by watching successfully how others interact with the exhibit.

Adults and children should see coming to Sportastic as exercise since by so doing it ensures that visitors get a workout by engaging in the exercises. Taking part in sports as a team is also one of the easiest ways of ensuring that visitors get exercise.

According to BBC news online, the Health Development Agency (HDA), (29/04/04), says that there is a desperate need for people especially in the UK to do regular exercise to decrease the growing levels of obesity risk, cardiovascular diseases and other ill health. It is therefore a good move that science centres engage in sports exhibitions to ensure that visitors get to understand and learn about the value of exercise in their daily lives.

Majority of visitors have been observed to visit Sportastic in-groups, and are able to interact with other groups that they meet at the science centre. Although a certain percentage of visitors do not read labels, it is crucial that labels are put in all the exhibits for ease of interaction with the exhibits. Positioning and the right font size of labels should also be taken into consideration.

There is no information on how fast top athletes can run nor is a list of names of top athletes and other sports personalities available. Most people that come to interact with the exhibit are in-groups for example either as friends or families. Children and their parents would all have a go at the exhibit or encourage other family members to also have a go.

The exhibits have ‘attraction power’, ‘holding power’ and ‘learning power’. The attraction power is basically from the audio and the euphoria made by the interactive screen in that it creates the atmosphere that gives the feeling of a real live sporting event. The holding power is from the fact that visitors especially children under 18 years old of age would always want to engage more than once with the exhibit. The learning power is mostly from the science behind sports and such things as knowing about reaction, balancing and co-ordination.
This calls for an argument by an article from the British Interactive Group (BIG), which says that if an exhibit does not respond immediately visitors will do it several times thinking that it may be broken or ultimately break it themselves. It further says that when the exhibit finally responds the visitors will be confused as to what they actually did to get the required results.

The difference with exhibits in Sportastic is that they respond immediately to what the visitor does. Visitors particularly children engage more than once with the exhibit in order to see if their running time will compare better than the previous score or time and this is not due to lack of immediate response as reiterated by BIG. It is also true what Bellanger Silke (1981) says from her abstract and that could relevantly fit with the sport exhibition that by coming to the science centre visitors are able to discover their bodies and use their bodies with all their senses.

Most visitors observed did not read labels. But were able to figure out where to press in order to start. With family members, the parents let the children have a go first and then they interact after them or the group would all interact with the exhibit at the same time.

There are rarely wheelchairs at the exhibits such as basketball and sprint challenge since most of the visitors always ride on the wheelchair throughout the exhibition space. This therefore calls for the explainers to initiate that visitors should use it within such exhibits as sprint challenge and basketball.

Another observation noted was the fact that signage within exhibition floor is poor since visitors kept on asking where the toilets are, which way is the imaginarium, planetarium, the TV studio and so on. It was also not clear to visitors where to go in cases where they lost their items like cameras, jackets and other valuables.

### 3.22 Visit to Science of Sports Exhibition at Science Museum in London

This is a special exhibition called Science of Sports developed by Science Museum in London in 1997. According to an article online by Tessa Sanderson (2004), Science of Sports Exhibition is an energetic and educational insight into the world of sports and with the Olympics, Euro 2004, the British Open and Wimbledon which are the big events in 2004.

Several new exhibits have been set up from February 2004 and will be running up to September 2004 to celebrate this year with more sporting events. Sanderson says that the exhibits are not just fun but will open up the world of sports and exercise to many people such as children and families and hopefully inspire them to make physical activity part of their lifestyles.

According to the information leaflet, Science of Sports gets visitors interacting with the exhibits. The exhibits are housed in first and second floors and use state of the art simulators and interactive displays.

One of the exhibits allows a visitor to dribble a football against the clock. At Bristol has this kind of exhibit, but instead of dribbling against the clock, the visitor scores the ball in the 4 different holes to compare against the top scorer in 2004. There is also an exhibit similar to the sprint challenge available At-Bristol, but instead of the visitor racing against the clock,
they have about three visitors competing against friends or family members in a quick complete action replay.

3.22.1 Reaction Time

![Reaction Time Exhibit]

*Figure 16: Test your reaction with 2 buttons (red and green). The exhibit allows the visitor to push the button when they see the light and press it again when they hear the sound/beep after which it gives the reaction time matched against Cathy Freeman’s Olympic 400 meters champion who had a reaction time off the blocks of 0.223 seconds.*
3.22.2 Sport personalities Exhibit

![Image of sport personalities exhibit]

*Figure 17: This gives the visitor a chance to match the sports personalities by pressing the yellow buttons over a period of 45 seconds. The faces of sport personalities appear on the infra red screen and the visitor have to match the name with the face.*

3.22.3 What Sport Am I Exhibit

These are different exhibits spread around the two floors of the science centre. The exhibit comprises of pictures of tennis, rugby, football, hockey, basketball, bowling, volleyball and so on. At the touch of a button the voice asks the visitor the question ‘which sport am I’, after which it gives a pause of 5 seconds and gives the answer.
3.22.4 BATAK

Photo 17: This is yet another exhibit similar to what is available at Bristol. The difference between this exhibit and the one at Bristol is that this particular exhibit has clear and visible signage where visitors have to press in order to start interaction with the exhibit.

3.22.5 Over Pronation and Supination

This is an exhibit that does not allow for any interactivity. The one available at Bristol is about “Why do trainers stink”. Both of them have a display of a shoe, but the one at the Science Museum is not about the stinky shoe but displays information as to why our shoes slowly wear away leaving clues how we place our feet when we walk.

According to http://www.steenwyk.com/pronsup.htm, pronation is,

“In simple term, pronation is the flattening out of the arch when the foot strikes the ground. Normally, the foot will pronate to absorb shock when the heel hits the ground, to assist in balance during mid-stance. The ankle will 'tip' towards the inside. Excessive pronation can be problematic because the shifting causes increased stress on the inside/medial aspect of the foot. It pulls on the stabilizing muscles in the lower leg (posterior tibialis) and often causes the knee to shift to the inside. The excessive stress on the body can overcompensate for this pronation and shift the ankle towards the outside causing the ankle to roll over”.

While supination is,

“Supination is the opposite motion of pronation. A foot is in supination when the ankle appears to be 'tipped' to the outside so you are standing on the outside border of the foot. Supination allows the foot to be a more stable, rigid structure for when we push off on our next step. The foot naturally supinates during the toe-off stage (when the heel first lifts off the ground until the end of the step) to provide more leverage and to help ‘roll’ off the toes. Excessive supination predisposes the ankle to injury because the stabilizing muscles on the outside of the lower leg (peroneals) are in a stretched
position. It does in not take much force to cause the ankle to roll over, potentially causing ligament damage”.

3.22.6 Rock climbing Exhibit

![Rock climbing exhibit](image.jpg)

*Figure 18: This is an exhibit that gets visitors to interact and compete against each other on climbing the rock, in that they have to compete against each other to see who can be the fastest in reaching the peak. The caption about the exhibit puts more emphasis on how visitors can ensure safety during rock climbing and the suitable gear for rock climbing. This kind of exhibit is not available At-Bristol.*

3.22.7 Why do Athletes use performance enhancers?

This is an information caption on what performance enhancers do to athletes? The same information caption is also available At-Bristol. It contains information on anabolic steroids, stimulants and erythropoietin (EPO); what they do to the body and why people should not take them. There is also information about the future of blood doping, designer drugs that are said to escape detection and gene doping which is an engineered DNA that would cause the body to produce more of a certain protein.
3.22.8 Injury

Information Caption that talks about how bad an injury can be? How to prevent an injury? What does warming up do and what to do after warming up?

3.22.9 Protective clothing

These are non interactive exhibits based on different clothing that sportsmen/women can wear to protect themselves and be comfortable when engaging in different sport such as yachting, rugby, American Football and so on. There are also some exhibits on the history of sports and sports gear from around the 1800’s.

3.23 General observations on Science of Sports

Science of sports at the Science Museum in London is a high budget exhibition. It is much more appealing in terms of presentation and design from the outside of the first floor in that there are pictures of normal cinema screen type. The pictures are of top sports personalities such as David Beckham, Serena Williams, and Michael Jordan to just mention a few.

Figure 19: The labels within the science of sport are in the form of flip charts with catchy words or phrases on the outside of the flip chart. For example, the catchy phrases and words that could be found are “Science of Throwing”, “In a Spin” “Did You Know”, “Reaction” “Respiration”, “All-round View” and so on. The information contained in the flip chart also has informative paragraph and subtitles with snappy endings.
Playing music normally played for aerobics is used to create the atmosphere within the exhibition floors. More information on the outside of the first floor that informs visitors about what they have to do within the exhibition floor in terms of safety when interacting with the exhibits. For example, children under 12 years old of age have to be supervised by an adult when using the exhibits at all times. Visitors are encouraged to speak to one of the explainers when not sure about safety measures before participating on an exhibit. Expectant mothers are also advised not to take part in any exhibit before consulting with the explainers. The captions are in a more visible font and bigger signage.

Another observation noted is the fact that the IMAX cinema runs shows on sport. The one that was being shown during this visit was on ‘Top Speed’ and was shown to compliment this year’s ultimate hands-on exhibition, ‘Science of Sports’ and is narrated by the famous toy story’s Tim Allen.

The captions/labels available within exhibition in Sport of Science capture what Beverley Serrel (1996) says,

“The overall goals for a visitor friendly label style are to appeal to a broad audience, to be used by the majority of visitors and to create positive experiences for them”.

The labels are what Serrel terms ‘Interpretive’ labels in that they are able to tell the story to visitors of all educational background and not just listing facts. Flip chart labels are also good due to the fact that if a visitor is not interested in the subject matter they could move on to another exhibit. In another study Elsa Feher (1990) says that

“Experience shows that captions and graphics do not fulfil the role of enticing and engaging the visitor”.

Science of sports uses explainers throughout the two floors to probe and enhance interaction between visitors and exhibits. This enables the visitor to get to a deeper level of interaction and understanding through the help of an explainer and to get the most out of the exhibit. Far beyond just explaining or answering questions, the explainer is able to bring the exhibit to life through activities and investigations. This benefits the visitor in that they are able to learn something that they could have otherwise missed, overlooked or under-looked.
4. Results

More information on the results of the questionnaire can be seen on appendix C

4.1 Demographical Information:

A total of eighty visitors (80) were interviewed.

Diagram 1

Visitors Age?

<table>
<thead>
<tr>
<th>Age ranges</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 &amp; over</td>
<td>16%</td>
</tr>
<tr>
<td>36-40</td>
<td>16%</td>
</tr>
<tr>
<td>31-35</td>
<td>7%</td>
</tr>
<tr>
<td>26-30</td>
<td>5%</td>
</tr>
<tr>
<td>21-25</td>
<td>1%</td>
</tr>
<tr>
<td>16-20</td>
<td>4%</td>
</tr>
<tr>
<td>11-15</td>
<td>30%</td>
</tr>
<tr>
<td>5-10</td>
<td>21%</td>
</tr>
</tbody>
</table>

Gender and Occupation?

From the interviewees, males constituted 43.53% while females were 56.47%. This indicates that females visiting the exhibition are more than males with approximately 13%. On the other hand students interviewed constituted 36.51%. This though is not a representational percentage of students who visit the centre since most student come as school groups. A similar study could therefore be made later, focused specifically on school groups alone.

Professionals comprised of the working class, scientists, consultants, teachers and so on and this group made 41.27%. The unemployed which were 15.87% mainly comprised of housewives who were mostly accompanying their children. The retired were mainly groups of grandfathers and grandmothers accompanying their granddaughters and grandsons.
Which Area do visitors come from?

A higher percentage of visitors came from within Bristol area and that stood at 35%. This was followed by 33% that comes within 60 minutes from Bristol area, while 10% came 90 minutes from Bristol area. Lastly there was ‘other’ that constitutes 10%. These were visitors coming from across the United Kingdom and those that were coming from countries such as France and Spain.

4.2 General information

Did you enjoy Sportastic Exhibition?

From a total of 80 visitors interviewed, 97.50% said that they enjoyed the exhibition while 2.50% indicated that they did not enjoy the exhibition. (Please see diagrams 2 & 3). Diagram 3 indicates what was enjoyed; what was not enjoyed is reflected on diagram 4.

Diagram 2

Which 3 exhibits did you enjoy most and which 3 exhibits did you least enjoy?

The diagram indicates which exhibits were enjoyed most (colored blue) and the three exhibits enjoyed least (colored red).

Diagram 2 indicates that sprint challenge, test your reaction and hot shots/football were the mostly enjoyed exhibits. While the skateboard challenge, skeleton bob and hot shots were the least enjoyed exhibits by visitors. The results correlates with observations made in that the same exhibits also seemed to be popular during observations.
Diagram 3

What did you enjoy most about the exhibition?

The enjoyment factor is specific to the exhibits on diagram 2 that were most enjoyed. The information is similar to that captured in observations (particularly with the sprint challenge, test your reaction and hot shots/football in that visitors are able to compete against each other and compare their result in a fun and entertaining manner. The exhibits are not only hands-on but minds-on as well, since visitors have to concentrate in what they are doing particularly when testing their skills.

Diagram 4

What didn’t you like about the exhibits?

The non enjoyment factor on diagram 4 is specific to the least enjoyed exhibits as indicated on chart 2. The least enjoyed exhibits are the skateboard challenge, skeleton bob and hot shots/football. Information about the skateboard and skeleton bob being the least enjoyed
exhibits correlates with observational information. Visitors were observed to do things in groups, but skateboard challenge and skeleton bob does not give visitors an opportunity to interact with the exhibits collectively.

Rating hot shots as the least enjoyed exhibit is does not however correlate with information made during observations since the exhibit appeared to be quite popular with the visitors and had holding power too in that visitors were able to spend a tremendous amount of time. For example, maximum time spent on the exhibit was 12 minutes while skateboard challenge had a maximum time of 3 minutes.

**Diagram 5**

**What did you learn from the exhibits?**

![Diagram 5](Image)

Diagram 5 indicates that without probing 16 visitors said they learnt that in certain sports you need reaction capabilities and that without reaction one cannot excel in certain sports. For example, this was from such exhibits as hockey, skateboard challenge; test your reaction and football. 9 visitors said that they learned about balancing.

Balancing and coordination effect are witnessed from sporting exhibits and events such as circus skills whereby visitors balance peacock feathers on their fingertips, nose, chin and forehead. There is also spinning of plates and juggling of balls which is also comprised of coordination skills. Visitors did also indicate that they now understand that to be a circus expert it is crucial that you excel in such skills as balancing and coordination.

On the other hand, two visitors said that they learnt that without good pulse and strength, it is not easy for sportsmen and women to perform better in any other sporting events. While 23 visitors fell under ‘other’.

Visitors said that they have now understood how difficult it is to do sports; some said that they have learnt that certain sporting activities are not for them; how unfit I am was the response of one of the visitors; how difficult it seems to be for wheelchair users and that to be confined to a wheelchair, one needs concentration, control and a certain amount of speed. Another visitor said that she now understand what makes her trainers smell from the stinky feet exhibit.
Diagram 6

In all did you find exhibits easy to use?

From diagram 6 visitors positive (Yes) response is in red while the negative (No) response is blue. From the diagram, 59 visitors said they did get guide support while 21 did not get help from the explainers. 33 visitors said they got enough information while 47 said that there was not enough information on the exhibits. 32 visitors said that they were able to read the labels and 48 visitors did not read the labels or did not find it necessary to read the labels since they are familiar with the events. Lastly, 63 visitors said that the exhibits were intuitive and 17 said that they were not intuitive.

Diagram 7

What would you be most interested in?

Answers to diagram 7 were given a rating of 1- 5. This was to find out what visitors would be interested in. For example visitor’s interest in the science of sport was given a score of 246. This is indicates that visitors are more interested in knowing about the science of each sporting activity.
Visitors also said that they would be interested in knowing information about famous players on each exhibit with a total score of 213. A score of 212 was given to the question on whether visitors would like to have a lecture or a talk by a famous player. Lastly information on history or origins of each sport preceded a lecture by a famous player with a total score of 208.

*Diagram 8*

*What do you think is the effect of sports on the body?*

<table>
<thead>
<tr>
<th>Effect of sport on body</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep fit</td>
<td>38%</td>
</tr>
<tr>
<td>Keep healthy</td>
<td>23%</td>
</tr>
<tr>
<td>Helps the heart</td>
<td>6%</td>
</tr>
<tr>
<td>Exercise</td>
<td>15%</td>
</tr>
<tr>
<td>Don't know</td>
<td>18%</td>
</tr>
</tbody>
</table>

Without probing visitors came up with the above information on diagram 8
Diagram 9

What would say of staff support within Sportastic?

From diagram 9 it can be seen that 59% of visitors said that staff was helpful. Comments such as gives control over the area; friendly; good and relaxed; nice and knowledgeable; supportive and provide information needed were given. 11% of visitors said that staff was not helpful.

Visitors comments were as follows: some said they did not get guide support when needed; kids were rudely spoken to by one of the explainers for not putting on the protective helmet when playing hockey; had very good smiles but not imposing.

Of the 15% that said did not see any, indications such as the exhibition floor would do with more staff and that they thought the floor was not assigned any explainers or guides. ‘Other’ scored 15% and visitors just stated varied which could either mean that the explainers were helpful or not helpful or that they did not see any.
Diagram 10 shows by percentage what visitors thought about the important aspects of adult rest area. This was said by visitors without probing. From the diagram, ‘other’ scored 13%. From here, comments such as clean area, range of activities, more space between exhibits, cheap snacks, availability of reading materials, access to the disabled, no smoking and that the space should be in the centre of the exhibition floor were captured.

The information here reflects back to the fact that most of the groups observed were family groups. For example, parents who would normally be bringing their kids to interact with the exhibits. These parents, after getting tired interacting with the exhibits, would want to sit down and relax while at the same time keeping a close eye on their kids and hence the aspect of visibility of kids which had a 25% rating from the chart.

Information about healthy food and drinks correlates with information given by explainers that visitors should be given a chance and an opportunity to choose between healthy eating and junk food.
Diagram 11 indicates that majority of visitors did not know about Sportastic until they visited At-Bristol. Learning about the exhibition from schools and friends came to 10% respectively. Both leaflets and At-Bristol Website followed with 9%. Other was 6% which could be family, At-Bristol members club or children 90’s society.

The importance of this information is that At-Bristol has been advertising Sportastic through all forms of media, and this is crucial in ascertaining which medium has had a profound impact. The information then shows that a better strategy would have to be devised to ensure that the message reaches people through all forms of media.
Amenities were rated from 1-5. Customer service scored highest with 375 followed by cleanliness by 271; value for money at 247; clear directions 229; toilets 219; shops scored 207 while restaurants and sports café scored 174 and 156 respectively.

Directions were given one of the highest score. The information is not however in correlation with the observations made in that most visitors kept on asking which way are the toilets, could not easily spot the name of the exhibition space – Sportastic; did not know where to go for lost items; also they did not know which way to the planetarium or the studio.

The reason the questionnaire addressed the issue of amenities is that museums researchers like Ambrose and Paine (2003) and Burcaw (1997) are of the feeling that a visit to the museum or science centre is a complete experience for most visitors, and every aspect contributes. Ambrose and Paine go on to say that dirty toilets, offhand staff or poor publications can spoil the visit as much as poor displays and hence the museum staff should consider every aspect.

On a personal level, the issue of amenities should be taken seriously since this adds to the convenience of visitors.
5. Discussions

As already indicated, At-Bristol had wanted a front-end evaluation of the tester exhibition, Sportastic, so as to eliminate errors when designing a traveling exhibition.

Exhibits in Sportastic illustrate scientific principles, through enjoyable play. It is a fact that sport is a way of life and plays a major role in almost every nationality. Almost everybody directly or indirectly participates in sport through cycling, walking, jogging and so on. Most people would also go out to watch sporting events like football, basketball, volleyball or athletics. Sport occupies our lives everyday on media such as TV, radio, newspapers and so on.

According to www.sciencemuseum.org.uk/press/sport, Science of sport is the latest trend in science centres to provide something different for visitors and also enable science centres to target new audiences.

Ambrose and Paine (2003) in their book Museum Basics also say that,

“"The changing style of museums and the changes affecting presentation methods through the application of new technologies are generating greater interest in ‘hands-on’ experiences for users”.

Something may also be learned, for as any educational psychologist will confirm, creative play is important in developmental terms and learning can and should be fun.

From the point of view of visitors to Sportastic, there seems to be a lack of connecting science and sports since none of the visitors mentioned the fact that there is science in sports from the questionnaire. This calls for At-Bristol to emphasise more the technology or science behind sport when constructing traveling exhibits. The idea of promoting science behind sports should also be reinforced by the explainers or guides on the floor.

Interactive exhibits within Sportastic can therefore be said to provide intellectual as well as physical action and give feedback to the visitors. Most of the exhibits are participatory, something based on the old education adage and also shared by Michael Belcher (1991) and George Hein (1998) that,

“I hear and I forget, I see and I remember, I do and I understand”.

http://www.heritageinterp.com/interpre2.htm also indicates that visitors are said to remember 10% of what they hear, 30% of what they read, 50% of what they see and 90% of what they do.

Exhibits within Sportastic are also hands-on, mind-on and body-on. For example, physical interaction does take place. Tim Caulton (1998) says that supporters of interactive movements argue that if visitors are enjoying themselves, it is more likely that learning will occur.
The same sentiments are shared by the Italian referee Pierluigi Collina as quoted by BBC online (http://news.bbc.co.uk/2/hi/uk_news/education/3892807.stm) when being awarded his honorary degree in the UK in July 2004. He was quoted saying,

“Sport is an important way to educate people, so the sports department is useful for society”.

As a matter of fact, in order for learning to take place in any museum or science centre, exhibits are supposed to comprise of both hands-on and minds on. According to Zahava D. Doering, (2004) there is a way in which visitors make use of museums something that is also relevant for the science centres.

Doering says that museum visits are for leisure in that visitors arrive with their own agendas and sense of time. Doering goes on to say that people who attend exhibitions think that they will agree with and will always filter content to suit their attitudes. In addition to this, Doering’s report has it that some visitors would use museums to acquire information and understanding, to have personal, emotional or aesthetic experience and exercise their imagination.

From the above statement, conclusions can be drawn that visitors are able to learn something from visiting a science centre or a museum. This also means that by coming to Sportastic, there are some learning outcomes that could be noticed from visitors as indicated in diagram 5 and learn about the fact that there is an amount of physics in sports.

This can be further argued with epistemological theories in which we learn and acquire knowledge as stated by Hein (1998). These are the ‘constructivism’ and ‘objectivism’ theories. Constructivism argues that knowledge and truth are constructed individually by the learners. Objectivist believe that knowledge and truth are external realities that learners are expected to replicate.

A comparison could therefore be drawn from both formal and informal learning situations. Formal way of learning is from a classroom where teachers think that they are the source of learning for their students. Formal way of learning normally starts from primary through secondary schools up to university level.

In an informal way of learning there is no teacher to dictate notes, no examinations written and so on. Instead, learning occurs through the efforts of the learners. This kind of learning can result in people being able to translate or match the knowledge they gained with their day-to-day experiences with knowledge acquired from the exhibits. This therefore shows that knowledge cannot be transferred, but can be construed.

In addition to the above statements Dawn M. Mackety (2003) says that education in museums is the principal mission in that they offer programs and experiences that are critical to both the museum and teachers successes. A positive museum experience is said to be able to enhance classroom instruction, maximize student learning and encourage return visits.

An example can be drawn from the fact that of developing countries where there is no science centres where teachers and students can enhance their learning with interactivities. Normally up-take of science subjects by students is very low since they only get to meet with science experiments in an informal way of learning that happens to be in the classroom.
The idea of having sport exhibitions in science centres should also therefore be seen as a positive move since schools do extra mural activities as part of the curriculum hence students and teachers can always go and enhance their skills and knowledge in an informal learning environments to motivate and maybe bring a change in attitudes amongst children as well as general visitors.

In addition Drew Ann Wake cited in James Bradburne (1998) talks about informal learning environments as,

“All these approaches have stressed two key factors: ‘bottom up’ or user driven learning and flexibility. The first factor means that the user must be considered the starting point for all effective learning; most science centres argue that interaction is enough, but in fact exhibits rarely allow visitors to actively shape the nature of the inquiry. The second factor stresses that our strategies, exhibitions, and institutions must be able to respond quickly and effectively to change. This also stimulates a constructive exchange between parent and child than static exhibits do”.

From the above quotation we can refer back to Hein (1998) when he talks about ways of making meanings from exhibitions which he categorises as ‘ergonomics’ that talks about physical aspect of exhibits like placement and lighting; ‘comfort’ which could be both physical and psychological is necessary for visitor experience. These could be basic things like places to rest, adequate restroom facilities and so on. While psychological comfort refers to noise levels and special orientation. This aspect has also been captured from the results and could be referenced on (diagram 12)

Lastly there is the advanced organiser. This category refers to the fact that the design of the exhibit need to engage the visitor to make the exhibit physically and intellectually available. This is all about communication between the exhibit and the visitor and the way the visitor interprets the artefact.

Caulton (1998) says that,

“The terms hands-on and interactive have similar meanings and have become largely interchangeable. ‘hands-on’ implies that visitors physically interact with an exhibit whether this is simply pushing buttons, using computer keyboard or engaging in a more complex activity with a multiplicity of outcomes. However, a hands-on exhibit that simply involves pushing a button is not truly interactive; rather it is reactive in that the exhibit simply follows a predetermined outcome”.

Jean-Jacques Rosseau as cited by Caro (1996) says that something is learned when discovered by the pupil himself and that the teacher is just there to create the conditions of such self observation and to guide with a few words dawning in the young mind of the proper explanations specially those of natural phenomena.

The above statement indicates that students should not just be confined to formal learning but be exposed to informal learning as well so as to stimulate their interest and way of thinking. If students learn by doing they tend to have a better understanding of things that happen around them since they are able to experiment, explore and be able to solve problems using their own ideas. We must however remember that any curriculum depends on teachers and their ability to implement some of the ideas learned in a science centre.
It is a fact that people learn throughout their lifetime as stated by Hein. The most common type of lifelong learning is free choice learning, learning which is self-motivated and guided by the needs and interests of the learner. People engage in free-choice learning through the use of museums science centres, libraries, parks, television, newspapers and books, when conversing with friends and family, and increasingly, through the Internet.

The idea of sport exhibition is good in that it teaches visitors, particularly children to be able to accept ups and downs because you sometimes win and you sometimes lose and it teaches them how to handle a loss by bouncing back. This also stimulates a more constructive exchange between parent and child than static exhibits do.

Belcher (1998) says that,

“The medium of exhibitions would be expected to feature prominently in these as the main vehicle for communicating information about the collections. A statement might therefore be made on the ration of permanent to temporary exhibitions and to what extent traveling exhibitions might be produced and circulated to other centers”.

The aim for setting up Sportastic exhibition at At-Bristol is to ultimately develop this temporary or tester exhibition into a traveling exhibition. The advantage of this ‘tester’ exhibition for turning into a traveling exhibition is that the exhibits are fewer in number. They also engage senses such as hearing, touching, seeing and smelling, regarded as bringing object and the viewer together, by Belcher (1998).

Belcher goes on to say that these senses have an impact on the visitor in that they enable communication and interaction to take place through a range of the human receptors producing a memorable effect on the part of the visitor. This aspect has proved true in that about 97.5% of visitors indicated that they have enjoyed interacting with exhibits within Sportastic.

In support of Belcher’s point of view, Ambrose and Paine (2003) says that effective museums do not just wait for people to come and visit but instead take their services to the communities.

At –Bristol has clearly stated what they want to achieve with their sport exhibition but it is not clear what they would like visitors to learn from each exhibit. It is therefore crucial for At-Bristol when planning and constructing the traveling exhibition to clearly state the learning objectives expected from the exhibits. Should this have been the case, the aspect of the questionnaire where visitors were asked if they learned something would have been matched with the learning objectives drawn by At-Bristol.

It would also be crucial to state the behavioral objectives as regards how they expect visitors to use the information that is being given by the science centre and the individual exhibits. Under observations on Sportastic, there is a section that talks about emotional outcomes under each individual exhibit. The emotional outcomes are crucial in that they would somehow have an impact on the visitors’ long term memory and can help accomplish behavioral objectives.

Exhibits in Science of Sports at the Science Museum in London are examples of the exhibits that could have a long term impact on visitors because of the colors, graphics, photos music
and so on aspects that are good in creating positive mood and feelings from interacting with the exhibits.

At-Bristol could do the same and also emphasize how much exercise people need, importance of exercise to the body, healthy eating, science behind each sport event and so on within each exhibit so that visitors could have fun and learn something as well that could impact on their lives.

Belcher (1998) goes on to say that the senses do have an impact on the visitor in that they enable communication and interaction to take place through the whole range of the human receptors resulting in a memorable effect on the part of the visitor.

It is also advisable for At-Bristol when venturing into temporary exhibits to take into consideration, the qualities of temporary exhibits described by Belcher as exhibits that could feature certain subjects that might not be included in permanent exhibitions. The advantage of temporary exhibits is also said to have the ability to respond to current events.

On the other hand, Ambrose and Paine (2003) say that the value of temporary exhibits is that they provide change and variety and allow museums to extend coverage of topics or subjects which have only limited coverage in displays.

For example, a report by BBC news on line has it that obesity is a current problem in the United Kingdom (UK) with people being prone to strokes or heart attacks. This is an issue that can be well addressed within an exhibition such as Sportastic to emphasize the importance of exercising and eating healthily on the general public.

Falk and Dierking (1995) say that

> “Few studies conducted with casual visitors suggest that staff and volunteers positively influence the experience, particularly when they are skilled interpreters, helping to facilitate and make the experience meaningful to visitors”.

The above statement calls for staff or the explainers to see the need to discuss with visitors about the science of sport. This will not only enhance learning and entertainment but the importance of sport to support the burning issue in the UK about obesity in order for the visitors to be enlightened about the importance of a healthy diet and exercise to the human body. There are other aspects that would require well trained and knowledgeable explainers as is the case at Science of Sports to take into account advising visitors on the right gear for each sport, warming up before engaging in a sporting activity, and exactly how much exercise should be done by different age groups and physical ability.

This is what knowledgeable explainers can indicate to the visitors. The fact that some visitor indicated from the questionnaire that explainers ‘had nice smiles and were not probing’ or ‘were not active’ should be considered if At-Bristol is to fully influence the experience and learning within Sportastic.

Explainers should be aware of the importance of probing and creating dialogue with visitors. It is only through this that importance of sport to the human body, science and technology behind sport and healthy eating could make the exhibits more interesting and worthwhile, for they are an important element of all in visitor experience. It is according to how efficient, smart, helpful and friendly they are that the science centre will be judged.
Paulette McManus (1996) when addressing the issue of visitors grasping scientific principles from exhibits says that

“The understanding of scientific principles and process may well be difficult to convey and museums might not be particularly good at it in any media – but they may be very good at something rather less narrowly cognitive. That is less getting across scientific fact and details, than furthering understanding through more general images and messages about the nature of science, its possibilities, relevance and limitations”.

Should temporary exhibits or traveling exhibits fail to delight, entertain, surprise and inform, this might not only disappoint the public but leave them disillusioned as well.

Touring exhibitions also have advantages and disadvantages that have to be taken into consideration before venturing into such a project. These are summarised from Belcher (1998) as follows:

They have the advantage of being seen by a wider group of people in different places even by those who would not be able to visit museums for different reasons. For science centres or museums that are funded by public gate takings, possibilities of charging a higher fee could be introduced to offset production costs or make profit.

Normally temporary exhibits are housed by other science centres, considerations and negotiations could therefore be made to share production costs with museums or science centres that are to host the exhibition. In addition to this, traveling exhibitions can promote the science centre widely and enhance its reputation in places where the exhibits are hosted.

On the disadvantages, Belcher (1998) describes these as ranging from safety and security of the exhibits. Inconvenience to either the museum or science centre and to the visitors. If exhibits were not conceived for traveling, there will be questions as regards to robustness, with erecting and functions which might not work out efficiently. Lastly, the exhibits need to be sufficiently flexible in order to adjust to the requirements of different locations.

In addition to the advantages and disadvantages of traveling exhibitions, such things as space requirements; weight of exhibits; service requirements such as power, water; security requirements; maintenance schedule and responsibilities; insurance details are some of the aspects that should be taken into consideration.

There is also a need to establish who will be responsible for assembling, dismantling and re-erection of the exhibition, packing, transport and administration. A checklist will also have to be devised and signed by the host. This can also be used to act as receipt for materials.

From the questionnaire result on the evaluation of Sportastic exhibition, there is an indication that this appeals to wider visitor groups comprised of different ages, knowledge, educational and social backgrounds. This has also shown that experience of visiting is shared by the different visitors who have been observed to have endurance for exhibits that interest them but pass the ones that interest them less.

On the question of visitors not reading labels or exhibits having learning outcomes Belcher (1998) says that visitors are not forced to look at exhibits, read labels, and enjoy or to respond in any other predetermined way. This is because in a museum or science centre, visitors should be given a chance to learn of their own free will, and with effective exhibits, learning will occur to the visitors even if they are not aware that they are learning something.
This notion is shared by constructivists such as Hein (1998) who say that visitors seldom read labels and spend little time on individual exhibition components. This though does not mean that labels should be done away with since most of the time visitor will need some information to refer to. From the results of this evaluation it is seen that exhibits that are more active like the Sprint Challenge, Test Your Reaction, Hot Shots Shooting Hoops (*please see diagram 2*) attract more visitors than passive exhibits like Skeleton Bob, Test Your Strength and Java Café.

It should also be noted that visitors come with different goals to the science centre. Some come specifically to fill out time, shelter from bad weather, seek inspiration, satisfy idle curiosity, acquire knowledge, educate children and spend time with families and friends. But in the end all these goals have to be catered for by the science centre by striving to appeal in all aspects to its visitors.

Hein (1998) and Caulton (1998) are both of the view that in the constructivist museum, visitors are encouraged to construct knowledge from the exhibit through personal and social interaction resulting in visitors being able to come up with conclusions about the meaning of the exhibition.

Intuitiveness of exhibits is an important aspect to be considered by any science centre when constructing exhibits. The exhibits from Sportastic are said to be intuitive by visitors who filled out the questionnaire. Caulton (1998) says that,

> The best hands-on exhibits are intuitive to use, and do not rely on the visitor reading complex instructions or large amounts of explanatory text. However, text and associated graphic images can play a key role in helping visitors use the exhibits.

This is true in that should exhibits not be intuitive, visitors can easily be bored and this can result in visitors trying to exert maximum force to get the exhibit to work. As regards to text or labeling on exhibits, there are some guidelines or criteria to follow.

Conclusion can be drawn from Hein (1995) that encompasses many cognitive and affective changes and making connections, fostering interests and curiosity and changing values and attitudes.

Hein (1995) has drawn up a list of making a meaning such as ergonomics which comprises of physical aspect of exhibits such as height and lighting. The second one effected by ergonomics is comfort. This is believed to be important for both physical and psychological comfort in order to trigger a positive visitor experience. For example, places to rest, adequate restroom facilities, soft floors and moderate room temperature. Psychological comfort involves noise levels, spatial orientation and so on. (*See diagram10*).

Creating a positive visitor experience should go hand in hand with characteristics of good exhibits and what visitors do in a museum as stated by Ian Simmons from BIG newsletter as published in the Internet. Simmons says that it is important for exhibit builders when fabricating exhibits to know that people barely read instructions and as a matter of fact, an exhibit must respond immediately because an exhibit which does not can be frustrating on the part of the visitor.

Simmons says that delicate looking exhibits will be treated with respect as opposed to tough looking exhibits. He also says that an exhibit should not do too much because it can be
confusing to the user. An issue of intuition has also been brought up and is said to enrich visitors’ experience. The issue of obvious labeling has also been brought up and that this should be within 0.5 meters from the exhibit or be placed within the exhibit and within reach of visitors when approaching or using the exhibit.

While an article by Bob Raiselis (2004) talks about characteristics of good interactive exhibits. Raiselis says that the exhibit should be inviting. This is the attraction power of the exhibit that we have talked about in this report. He goes on to say that navigation of the exhibit should be understandable since failure to do this might make the visitor feel stupid for not being able to get the exhibit work. A good interactive exhibit is also supposed to enable visitors to discover things on their own and have a beginning and an end.

Interaction among visitors should also be stimulated by a good exhibit. It is said that an exhibit that could only be used by one person is not as successful as an exhibit that could be used by more than one person. Complicated concepts of topics should be simplified; above all, Raiselis (2004) says that the exhibit should be accessible to people of all ages, social, educational backgrounds and so on. In the end the visitors should be able to take something with them acquired from the exhibit.

Still on characteristics of good exhibits, Burcaw (1997) says that the exhibit should be safe and secure, visible, have attraction and holding power, aesthetically appealing, worthwhile and be in good taste.

Without these characteristics, the exhibit will not be able to fully engage, excite or reveal to the visitor the gist of the topic or the story being presented, and in that way visitors will not be able to relate to or identify with the particular exhibit. This will also make interpretation by the visitor difficult for it does not have interpretive characteristics because it was not built with the learning, behavioral and emotional objectives that have to be met.

### 5.1 Conclusions

In conclusion, the following recommendations will be important for At-Bristol to consider when fabricating traveling exhibitions and possibly for other exhibitions as well. All the floors will need clear signage to amenities like toilets, other exhibition places like the planetarium, to the section for ‘lost items’ and so on. It can be frustrating for visitors to search for explainers to ask where such places are. The current signage on the floor is not quite visible to visitors and will need to be in bright colors and fonts that could be read from a distance or upon entrance to the exhibition floors.

Although the majority of visitors seldom read labels, these will also have to be written in bigger fonts and be placed at eye level so that they can be easily seen. The warning sign at the hockey exhibit was small and wrongly placed out of sight of visitors. This will also need bigger signage and font. Some captions were placed outside the exhibits thus creating confusion as to whether they are part of the exhibit.

In order for visitors to gain trust in the science centre, the safety of the exhibits should be on top of the agenda. The fact that that there have been a few injuries on the floor calls for review of the exhibits causing injuries. For example, the sprint challenge will need padding or cushioning on the sides and at the finish line to minimise injuries that might come upon
impact when hitting the wall. Alternatively, the space between the finish line and the wall could be increased by a few meters.

It is also a fact that every institution has to strive for 100% customer satisfaction. It also has to be borne in mind that customer satisfaction measures are inadequate on their own, they need supplementing by a measure of loyalty. At Bristol management should therefore establish or emphasise the basic requisites for customer satisfaction; managers should identify and eliminate causes of dissatisfaction and emphasize improvements that drive customer satisfaction no matter how trivial they are in order to create long lasting relationships with the visitors.

Exhibits like skeleton bob will need to have interactivity in terms of controlling the motions, body weight and possibly speed instead of the visitor just watching the film. The journey could also be timed, that is having a beginning and an end or equipped with a reset button.

Lastly explainers should be made aware of the importance of probing on the floor in order for visitors to grasp the benefits of sports or exercise to the body, importance of healthy eating to the human body. It will also be crucial for explainers to advise on proper clothing for each sport, advantages of warming up and how much exercise should be done by people with different capabilities in order for the exhibition to be more effective.
References


Ryegärd, J. 2003. Sport och Vetenskap. Gotland County


http://www.big.uk.com/knowledgebase/exhibits/exhibits_building_secrets_2htm

http://www.exploratorium.edu.hockey

http://www.geocities.com/thesciencefiles/physicsof/basketball.html

http://heritageinterp.com/interpre2.htm

http://library.thinkquest.org/3049/version2/racing

http://news.bbc.co.uk/2/hi/uk_news/education/3892807.stm

http://www.steenwyk.com/pronsup.htm


Appendices
Appendix A

Questionnaire

Please take a few minutes of your time to answer the following questions.

1. Did you enjoy the sports exhibition? Yes ( ) No ( )

2. If no state why?
.................................................................................................................................
.................................................................................................................................
.................................................................................................................................

3. How would you describe the sports exhibition in a few words to a friend?
.................................................................................................................................
.................................................................................................................................
.................................................................................................................................

4. What is the title of the exhibition you have just visited?
.................................................................................................................................
.................................................................................................................................
.................................................................................................................................

5. What do you think you have learnt from your visit to the sport exhibition?
.................................................................................................................................
.................................................................................................................................
.................................................................................................................................

6. Which 3 exhibits did you enjoy most?
.................................................................................................................................
.................................................................................................................................
.................................................................................................................................
(a) What did you like most about the exhibits?
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
(b) Which 3 exhibits did you enjoy least?
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
(c) What didn’t you like about the exhibits?
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
10. In general did you find the exhibits easy to use?   Yes ( )   No ( )
(Please tick Yes/no from each of the following)
(a) Were they intuitive?      Yes ( )   No ( )
(b) Did you read the labels? Yes ( )   No ( )
(c) Did you have enough information on how to operate the games? Yes ( )   No ( )
(d) Did the explainers help? Yes ( )   No ( )

11. What else would you like to see in our sports exhibition?
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
11. From the following what would interest you? (Please rate these from 1 to 5. 1 being the lowest and 5 being the highest).
(a) Lecture by a famous sport player?
(b) More information about famous players for each exhibit?
(c) Knowing more about the history of each sport?
(d) Learn more about science of sport?
(e) Other (please specify) …………………………………………………………

12. What would you say about staff support within the sport exhibition?
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………………………………………………………………………
13. How did you first learn about the sports exhibition? (Circle as many as apply)
(a) During At-Bristol visit
(b) From friends
(c) From school
(e) At-Bristol Website
(f) Local Radio
(g) Through leaflets
(h) Other (Please specify)

14. How would rate the following amenities throughout Explore At-Bristol? (Please rate these from 1 to 5. 1 being the lowest and 5 being the highest).
(a) Sports Café  
(b) Shops  
(c) Restaurants  
(d) Toilets  
(e) Directions  
(f) Customer service  
(g) Value for money  
(h) General cleanliness

15. Would you like to visit sports exhibition again? Yes (  ) No (  )

16. Age (please tick appropriate)  
5 - 10 (  )  11 – 15 (  )  16 – 20 (  )  21 – 25 (  )  26 – 30 (  )  31 – 35 (  )  35 – 40 (  )  41 and over (  )

17. Gender (please tick appropriate)  
Female (  )  Male (  )

18. Occupation: ________________________________________________

19. Name (optional) ________________________________________________

20. From where are you visiting At-Bristol? (Please circle appropriate)  
(a) Bristol Area  
(b) 60 minutes from Bristol  
(c) 90 Minutes from Bristol  
(d) Other (please specify) …………………………………………………………….

Thank you for feeling out this questionnaire. The information will be useful in improving the services that At-Bristol offers to visitors’ satisfaction.
Appendix B

Have your say Comments

The big question: “Is sport becoming more about technology than talent? Does this give an unfair advantage to those with more money than sport”?

Summary of visitors’ comments

<table>
<thead>
<tr>
<th>Is sport becoming talent?</th>
<th>Or is more about technology?</th>
<th>Unfair advantage to those with more money than sport?</th>
<th>Irrelevant answer</th>
<th>Total respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>17</td>
<td>11</td>
<td>17</td>
<td>28</td>
</tr>
</tbody>
</table>