

Augmented Reality Pool Training Aid: Start-Up Scoping Report

Executive Summary

The following report outlines a start-up opportunity for a new training tool for cue sports, such as pool and snooker. Utilising Mixed Reality (MR) technologies, we aim to produce and provide a new system for wearable Head Mounted Display (HMD), such as the Microsoft HoloLens, to reduce the time taken for beginner and amateur cue sports players to improve their game skills, such as hitting, potting, or positioning game balls. This system could be bought, experienced at a physical location similar to a Virtual Reality (VR) arcade, or sold to existing Pool Halls to expand their current set-up. Aside from the benefits to cue sports players, there is also a large number of casual players and VR enthusiasts who would be interested in such a system due to the use of a new emerging technology. For this system, a bespoke software solution needs developing, as well as marketing and store setup expertise. We aim to secure a capital investment which will allow us to grow our team to handle marketing and in store business running, as well as developing, maintaining, and improving the software application itself. A partnership with a HMD manufacturer would also be beneficial to reduce the cost and overhead of the physical hardware needed.

Evaluation of Potential Opportunity

Although having a low entry curve to the sport, with many people playing casually in a pub or dedicated pool hall, cue sports can be one of the most challenging and time-consuming sports to improve upon and succeed at. Training often requires countless hours of individual work in order to improve and be semi-successful in potting the ball you aimed at. However, there are many other aspects to the game as well such as applying spin to the cue ball, having the cue ball end up in a good position for your next shot, being able to think two or more shots ahead, building high scoring breaks, or snookering (see Appendix B) your opponent just to name a few^(TERRY-PREP). These skills also require a huge time commitment to improve upon, and this is before playing any games against people which is vital for skill development^(PRO_SNOOK_BLOG).

In terms of developing said skills, there are currently only a few options at present. First you can perform potting and technique training drills^(CUE-DRILLS), but this method provides no real feedback on what you are doing incorrectly. Secondly, you can pay for a professional coach who will give form and technique feedback, but will still require many hours outside of these sessions to improve and develop, not to mention being expensive – up to £120 per hour in some cases^(TERRY-ITO1). Additionally, many hours of game time will also be required in order to combine these skills correctly and effectively.

New and amateur players tend to struggle most with consistently hitting and potting shots, as this takes a lot of time to develop accuracy. Even through the training methods described above, a lot of trial and error is needed in order to improve this accuracy, even for somewhat competent players. It also, like many sports, requires constant attention to retain and can be lost very quickly. As this is debatably the most important skill of a pool or snooker player, being able to develop this skill as quickly as possible will allow players to succeed in matched and improve other aspects of their game much quicker and more easily. From an interview with the previous president of the University of Bristol Pool and Snooker Club, it was indicated that ... [Interview answers in here.](#)

With cue sports are as popular as ever it is vital that action is taken now in order to succeed with this opportunity. Snooker especially is beginning to regain the national popularity that it had in the 1980s, with over 25% (or 17.1 million) of the UK population (66.8 million)^(OFFICE-NAT-STATS) having watched the 2020 World Snooker Championship Final. This was up from 11.8 million in 2019^(WST.TV). Whilst not as widely watched as snooker, bar billiards – or pool – is still very popular and is found in many pubs, dedicated pool halls and sports bars.

When it comes to the technology used, the Mixed reality market is set to be one of the fastest growing over the next six years. With the market valued at \$553 million in 2020, and set to rise to over \$5.81 billion by 2026, Mixed Reality (MR) in the gaming and entertainment sectors is set to be a major driving force of the market's growth^(MORDOR-MR). Looking at a similar technology, there is a well established Virtual Reality (VR) market valued at \$17.25 billion in 2020 and set to rise to over \$184.66 billion by 2026^(MORDOR-VR). A big driving force of this growth has come from the gaming and entertainment industry, with many VR arcades succeeding and being very profitable over recent years^{(IMMOTION-VR)(DNA-VR)(CHIMERA-VR)}. Additionally, approximately 2.25 million gaming enthusiasts have their own VR equipment^{(STEAM)(STATISTA)}, again contributing to the large VR market and projected growth. With MR set to follow a similar trend as VR in the coming years, it is to become a very profitable and virtuous industry to become a part of and lead. Due to the current MR technology market just beginning to accelerate in growth, there are no known systems or experiences to compete with. Acting now and establishing a brand at the start of a new trend will allow us to succeed and be most profitable, cementing the need to act now.

Value Proposition

- IDEA
 - Develop a mixed reality application for a Microsoft HoloLens in order to decrease the amount of time it takes new and novice cue sports players to increase their aiming ability
- HOW
 - Using computer vision techniques and the HoloLens hardware, the wearer of the headset will be able to see shot guide lines on the table in front of them. These lines correspond to a 'hit marker' on the cue ball which indicates where to hit the ball.
 - Other features it will have include: Automatic aim for a selected ball and pocket, Shot recommendation, post collision guide lines, allow for users to apply spin to the ball and see how this effects the balls path pre and post collision
- WHY VALUABLE AND FOR WHO
 - Valuable for any amateur or new player as it will reduce the time taken for them to develop their accuracy – a major part of the game.
 - It will also increase enjoyment in the game due to players becoming successful and scoring points straight away rather than after an extended period of training or play time. The novelty of the cutting-edge technology used will also attract users and increase enjoyment.
- HOW BETTER THAN OTHER
 - Other solutions use projectors above the table to display guide lines and information onto the table. This means that it is hard to move, and only compatible with that table.
 - My device is completely mobile and can be used with any table (with the appropriate markers/QR codes). Allows for freedom of movement as well as system portability.
 - User experience can be tailored to the user as they are wearing the headset, and so customisations can be made for each individual user as they play
 - Already a wide range of MR HMD available from many manufacturers (<https://www.slant.co/options/5655/alternatives/~microsoft-hololens-alternatives>), and Microsoft being a big driving force of the tech, releasing 2 MR headsets, with the latest having great capability already (<https://www.microsoft.com/en-us/hololens>). Tech will only get better with time due to growing market and high competition.

Impact

- NECESSARY STEPS

- Develop prototype and progress to a final polished solution through an agile development cycle
- Test device to ensure reliability, stability in a wide range of lighting environments, and compatibility with a large number of pool and snooker tables
- Source capital investment for development cost and venue set-up
- Recruit business and store managers (my expertise lie in the development side, so I can lead this), as well as promotion, website etc
- Try to attain partnership and/or support from Microsoft to reduce the cost of headsets and help lead development of head mounted display technology
- MEASURABLE IMPACTS
 - Have prototype by end of month, beta system, investment, Microsoft partnership by end of Q2, final system by end Q3, Store open and launch by start Q4

Appendix A

Below are the interview questions I sent to the former president of the University of Bristol Pool and Snooker Club, along with their responses (in orange). No identifiable or sensitive information was collected, and consent was received from the individual prior to asking the questions.

Question 1: Do you perform training drills either alone or with others?

- Yes
- No

Question 2: If you answered 'YES' to question 1, what technique do you focus on the most when training? Please select all that apply

- Hitting the targeted ball
- Potting the targeted ball
- Positioning the cue ball optimally for the next shot
- Break building
- Safety shots
- Complex / Spin shots

Question 3: Would you like the idea of using a head mounted display when training that provides feedback and guidance on your shots whilst you play?

- Yes
- No
- Maybe

Question 4: What features or visual guidance would you find useful for such a device to have?

Question 5: What would you be willing to pay for such a device?

- £0-£250
- £250-£500
- £500-£1000
- £1000-£2500
- £2500-£5000
- £5000+

Question 6: Would you ever pay for pool or snooker training?

- I have in the past

- Yes
- No
- Maybe

Question 7: How much would you consider paying for training? (Per session)

- £0
- £0-£10
- £10-£20
- £20-£30
- £30-£40
- £40-£50
- £50+

Question 8: Would you ever go to a Virtual Reality arcade or Virtual Reality experience recreationally?

- I have in the previously.
- I would like to.
- No

Question 9: How much do you think (per hour) a Virtual Reality arcade or Virtual Reality experience should cost?

- £10-£20
- £20-£30
- £30-£40
- £40-£50
- £50+

Question 10: Who do you think would benefit from such a system? Please select all which apply.

- New players
- Amateur players
- Club players
- Semi-Professional players
- Professional players

Appendix B

Below are some useful explanations of cue sports specific terminologies.

- **Snookering**
 - Forcing the cue ball into a position such that the opposing player cannot hit a valid object ball directly – meaning they must first hit a cushion before a valid object ball to avoid a foul.

Bibliography

Anon., 2020. *Modor Intelligence*. [Online]

Available at: <https://www.mordorintelligence.com/industry-reports/mixed-reality-market>

[Accessed 07 March 2021].

Anon., 2020. *WST.tv*. [Online]

Available at: <https://wst.tv/world-snooker-championship-pockets-record-viewing-figures/#:~:text=The%20World%20Championship%20achieved%20strong,reporting%20on%20Radio%205%20Live.>

[Accessed 3 March 2021].

Anon., 2021. *Cue Drills*. [Online]

Available at: <http://www.cuedrills.com/drills/snooker-drills/>

[Accessed 07 March 2021].

Anon., 2021. *Office for National Statistics*. [Online]

Available at:

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/overviewoftheukpopulation/january2021>

[Accessed 07 March 2021].

Griffiths, T., 2021. *Terry Griffiths Snooker*. [Online]

Available at: <https://www.terrygriffithssnooker.com/snooker-training/one-to-one-coaching/>

[Accessed 07 March 2021].

Griffiths, T., 2021. *Terry Griffiths Snooker*. [Online]

Available at: <https://www.terrygriffithssnooker.com/snooker-tips/practice-and-preparation/>

[Accessed 3 March 2021].

Wilson, K., 2014. *Pro Snooker Blog*. [Online]

Available at: <https://www.prosnookerblog.com/2014/02/11/snooker-tips-from-kyren-wilson/>

[Accessed 3 March 2021].