Unlocking Accessible Escape Rooms

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ABSTRACT
Escape rooms are popular recreational activities. Players are locked in a room and must solve a series of puzzles in order to 'escape'. To date there has been no research conducted to examine the accessibility of escape rooms for individuals with disabilities. Escape room designers and players completed an online questionnaire exploring the use of technology and the accessibility of escape rooms. Results show that accessibility remains a key challenge in the design and implementation of escape rooms, despite the inclusion of technology that could be used to improve the experience of users with disabilities.

Author Keywords
Accessibility, Technology, Escape Room, Player Experience

INTRODUCTION
Escape rooms are a popular recreational activity for the general public. Groups of 3-7 players (mean 4.58 [9]) are locked in a room and solve a series of puzzles in order to 'escape' from the room within a given time frame; typically one hour. There exists a number of accessibility issues in escape rooms, including physical and sensory barriers that arise when players are unable to perceive objects or clues in the room around them. In recent years, more technology has been included in escape rooms as they become ever more sophisticated and designers attempt to create more immersive experiences. It could reasonably be expected that the upsurge in technology could mitigate these accessibility issues, as we have seen with other areas such as mobile phone accessibility [6]. However, this has not been reported in the case of escape rooms.

BACKGROUND
Escape rooms are immersive gamified experiences. 90% of rooms have a theme [9], e.g. horror, prison, wartime. Early rooms (1st generation) consisted solely of physical locks, whereas more modern rooms (2nd generation) contain electronic and technical components in order to develop the narrative and increase immersion in the experience.

The goal within escape rooms is for players to enter a state of flow [5]. A game-master guides players through the experience and can communicate with them through various means, such as verbally using radios, or visually on a screen inside the room. This ensures that players are not too frustrated if they do not achieve success. Game-based learning can be very effective in teaching abstract concepts and giving a level of real-world experience [2]. To this end, escape rooms have been themed to provide educational benefits through active learning [11, 3] and immersion in the theme topics. Borrego et al [3] created an escape room for university students to engage with networking and information security. Students reported an increase in motivation and willingness to learn. An open source platform "Escape Room Kit" [4] provides plans so that educators at different level of school and university can use to build escape rooms focused on different topics, e.g. WW1.

A wide variety of technology is used in escape rooms, e.g. tangible and contextually-aware computing. The inclusion of such technology is likely to increase as escape rooms evolve [10]. For example, it can aid in the immersive elements of the room, e.g. by playing ambient music when certain puzzles are uncovered. Embedded technology may also be useful for adjusting feedback modalities, in order to cater for reduced perception, or to adjust the difficulty of puzzles, but these remain under-researched topics.

Given that the general public is the target audience, people with varied disabilities will wish to engage with escape rooms. However, the range of puzzles is extensive, e.g. searching for hidden objects, or using ultra-violet light to uncover messages or codes [9]. Some will be inaccessible for some user groups. For example, searching for hidden objects could be challenging and dangerous for an individual with a visual impairment.

We conducted a questionnaire to investigate: (1) How is technology used in escape rooms? (2) What are the accessibility barriers that exist in escape rooms?

ONLINE QUESTIONNAIRE

Procedure and Participants
Players and designers of escape rooms were recruited to complete an online questionnaire. The link to the questionnaire was posted on social media (Facebook and Twitter) and to Reddit's r/SampleSize and r/EscapeRooms. No incentive was offered for completing the questionnaire. Participants affirmed consent and provided demographic information which confirmed their eligibility to complete the study. There were two main sections in the questionnaire[1]: (1) The technology that participants had included or experienced in an escape room,

[1] https://github.com/rachelmenzies/EscapeRoomQuestionnaire

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and (2) How individuals with accessibility needs could experience escape rooms. All questions were optional. Participants were taken to a debriefing page after submitting their responses. For analysis, participants have been allocated a participant ID, beginning "D" for designers and "P" for players.

69 participants (35 male, 32 female, 2 did not say) completed the questionnaire with a mean age of 22 years (min: 18 years, max: 53 years). One participant declined to provide their age. 21 participants were owners or designed escape rooms and 48 participants had completed escape rooms. 42 participants were resident in North America, 18 in Europe, five in South America, one in Australia, one in Asia, and two did not say.

Analysis Methods

Affinity diagramming [1] was used to analyse the open-ended question responses. *Affinity notes* were selected by the researcher from the participants' responses that were considered to be relevant to the research questions. Three participants with expertise in qualitative research methods and/or escape rooms were given 50% of the affinity notes (n=145) and were briefed on the research questions relevant to this study. The researcher then analysed the remaining affinity notes (n=144). In total, 267 (92%) were included in the final diagram.

Affinity Diagram Results

Lack of Accessibility

Participants reports that there is a lack of accessibility within the escape rooms industry. Designers attribute this to a lack of business case for inclusion, e.g. *"it's a matter of supply and demand and impossible to design for all disabilities"* (D21). While some have pointed to retrospective adjustments being made to include specific visitors, this is a very small minority of designers. There is evidence that many escape rooms are entirely inaccessible due to their physical location.

Players report that they were sometimes unable to perceive feedback from puzzles due to a disability, e.g hear a latch clicking elsewhere in the room, which slowed their progress. Many puzzles are designed using a single modality, e.g. sound: *"we had to receive a puzzle via an old-style telephone ... very difficult to hear"* (P3). In this case, players are excluded from specific elements of the room and must rely on collaborating with others to complete the tasks. Although there are exceptions, participants typically view this reliance on others as a barrier to their full engagement, e.g. *"being in a wheelchair means that you may not have an opportunity to search for items in the game"* (P21). However, designers view this collaboration with others simply as a crucial part of the game-play experience, e.g. *"the great thing ... is that it is a group/team activity so the weight of the game does not fall on one person"* (D4). Players also reported a lack of accessibility for those with colour vision deficiencies or physical disabilities, e.g. moving around or accessing materials from a wheelchair.

Situational Challenges

Players noted that a balance should be struck between puzzle variety, player ability and the room design. Many participants described situational impairments that arose due to environmental factors, such as poor light or increased ambient sounds, e.g. *"locks can be difficult to open in dim light"* (D21). This is an example of the disruptive nature of immersion design, which could be exacerbated for individuals with disabilities.

Role of the Game-master

The game-master is a key figure in escape rooms and is responsible for ensuring that players are able to complete tasks, providing hints where appropriate, and overseeing game-play. Both designers and players considered the communication of the game-master to be crucial in the commercial success of an escape room. However, many communication channels are designed as a single modality (such as using radios to provide auditory clues) and this can exacerbate accessibility issues for players and can lead to them being excluded from the communication, e.g. *"I'm deaf and my main bugbear in escape rooms is the use of walkie-talkies... I have no chance!"* (P25) and relying on other team members to participate. In this situation, participants felt that they had to relinquish their independence that they may have had to work hard to achieve.

Immersion

Immersion is key, particularly where there is a set narrative or theme. Many participants noted that technology is a primary mechanism for this and can be used to surprise the players and increase their enjoyment of the room, e.g. *"anytime something happens that players don't expect, it's a win"* (D11). However, it can also conflict with the theme and detract from the narrative, e.g. *"an iPad on a satanic altar - why?"* (P16).

DISCUSSION AND CONCLUSION

Accessibility is lacking in escape rooms leading to the exclusion or reduced participation of users with disabilities. In contrast, designers do not value accessibility. Technology use has increased rapidly in recent years, but has not been used to reduce accessibility barriers as it has in other contexts. The results highlight the balance between accessibility and situational impairments [8]. There is often be a reliance of players with disabilities on their able-bodied peers, since it may not be possible for players with a disability, such as a visual or hearing impairment, to solve each puzzle in any given room.

Observational studies, e.g.[10] should be conducted to investigate how users, both with and without disabilities, work together to overcome interaction challenges within this specific setting. Designers are largely of the opinion that collaboration is a key element of the rooms, but there is no consideration given to groups comprising solely of players with disabilities. This is concerning for two reasons: (1) that designers do not value designing for disabilities, and (2) players are being actively excluded because they are not valued by designers.

The use of technology has been to develop a narrative or a theme, with little or no consideration given to the accessibility of the technology. This could be for a number of reasons, e.g. lack of awareness or motivation and requires further exploration through targeted interviews to gain an understanding of the design processes. Following this, an accessible experience will be developed that all users can fully engage with, involving stakeholders such as the designers, game-masters and players in an inclusive design process [7]. This will serve as a proof of concept for future developments in accessible escape room technology.

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