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Inscrutable Games: How Players Respond to Illegible or Opaque Game Design

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ABSTRACT

In game design literature, it is generally suggested that players should be provided with useful feedback on their actions, and given a sense of control over their impact on the game. However, some games with complicated and opaque dynamics are still valued by many. These games are "procedurally hostile," as it is difficult to understand the connection between player action and effect on the game state.

In this paper, we explore the experience of playing an intentionally inscrutable game, with no winning strategy. Using a mixed methods approach, we find that while players initially follow a logical and systematic approach, there are a range of responses to the players' failure to understand how their actions affect the game state. Apart from frustration, we find some players embrace the narrative, shifting to enjoying the game as a primarily role-playing experience. This finding is useful to game designers, as it gives insight into the initial response players have to complex game systems and how players make meaning over time.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; • **Applied computing** → **Computer games**.

KEYWORDS

legibility, game design, theorycrafting

1 INTRODUCTION

One of the most interesting aspects of games is that they are often designed to be awkward and have unnecessary barriers. For example, paraphrasing Bernard Suits's [51] example, the golf ball is small, the hole is far away, and the only tool permitted is an expensive stick. The design of golf is in conflict with goal-driven design wisdom, that asks we bring the hole closer, make it larger, eliminate the need for tools and ensure the player reaches their goal as quickly and efficiently as possible. They require effort [1], and challenge can be found in various forms, whether physically, strategically, tactically or narratively. The task of defining this is one of the core responsibilities of the game designer. In particular, for more complex games with lots of moving parts, "scaffolding" how new players learn these systems is part of the design process that requires a lot of thought[17, 33], regardless of genre or platform.

Despite the wisdom of easing players into complex games through tutorials, onboarding and other strategies, there are still many examples of popular games that are "procedurally hostile" [57] where the inscrutability and illegibility of systems are part of the appeal. Costikyan describes this as the fun of "analytical complexity"[7]. One form of this is common in open world style games, such as Minecraft[37] and Terraria[47], where players are taught the basic grammar of interactions (mine, craft) and are left alone to discover and uncover the complexities (e.g. combining different materials for new effects, and even that such a process is possible). More extreme examples are games like Dwarf Fortress[13], which hides vastly complex and nuanced systems for the player to attempt to navigate with very little guidance. In these examples, the game is ultimately legible and understandable even if the process of learning is complex. Player actions in games typically have direct and measurable effects. Yet, we find there are games that take their complexity and illegibility to even further extremes, and are effectively inscrutable.

The 2018 game Cultist Simulator provides an interesting case study as a game about process, as the theme closely overlaps the gameplay. The player takes the role of a mythos-adjacent cultist, attempting to gain power through complex interactions of rituals and rites. As a player, you literally attempt to divine the nature of esoteric powers as modelled by the game, by performing rituals using the game as an interface [61], based on developing complex theories of logic through play. Another example is in the Football Manager[22] series of games, where the player takes control of a football (soccer) team and has a huge range of possible actions, but the typical positive outcome (winning matches) is only indirectly linked to these decisions. These are games where it is very difficult to know what the optimal decision is, and very difficult to read the consequences of actions taken. For example, in meetings with team-members you can choose where to put your hands (i.e. on your hips, arms crossed, etc), but the precise effect of this decision is difficult to extract from the hundreds of other tiny choices made. These are "noisy" systems that players must come to terms with. Crucially this is a difference between "in game" and "at game" frustration[15] - it is not a skill or interface challenge caused by unclear information design, but a systems challenge in deciphering how the mechanisms of the game behave.

The legibility of the link between player action and their advancement towards explicit or implicit in-game goals represents and interesting paradox for game designers. We generally want to guide the player towards success, for whatever measure of success fits the design (e.g. [14, 33]. At the same time, games in which the correct action is obvious to players quickly become laborious and ungame-like (e.g. [24]), leading to a narrow corridor designing games that are not too hard, and not too easy[9]. The current paper attempts to understand this contradiction better, by studying something relatively overlooked, as perhaps an unusual position - what is the player experience when confronted with a game that is

genuinely inscrutable? Specifically, when confronted with a game where it is not possible to learn the "correct" course of action, how do players respond?

In the following sections, we will first review literature that explores how players respond to complex games, and the approach of designers in designing such games. Subsequently, we present a mixed methods study in two parts, where players were recruited to play a custom made game that was designed specifically to be inscrutable. In part 1, we quantitatively analyse the interactions of 1493 players to understand the problem solving strategies they employed. In part 2, we report on a reflexive thematic analysis based on interviews with a sample of players. Findings suggest that players tend to approach games with an empirical and theory-driven mindset, however adjust their behaviour and perception of success as they play. We finish by presenting implications for our understanding of the practice of game design.

2 THEORYCRAFTING

The process by which players come to understand games and their systems is a key interest to designers. There is a lot of work that explores how players learn game systems (e.g. [20, 21, 43, 44]), and Koster argues this is often the fun in games, as the process of learning and finding patterns is rewarding [30, 58]. Games are often highly complex, with multiple inter-related mechanics, visible and invisible to the player. Typically, through this deep understanding, players gain mastery that may give some in- or out-game advantage, such as advancement in narratives, or achievement. However, some games are oriented entirely around the learning process, and are designed explicitly around uncovering the rules and logic at the heart of the game, and finish once this is complete. For example, games such as "Please Don't Touch Anything"[45] and VICCP[46] are designed to encourage players in experimenting within the system to figure out the rules, which are never explained, using failure as an explicit mechanism for learning [11]. Examples of this design approach outside videogames are the classic card game Mao[41], in which the rules are never explained to the players, and the game Mornington Crescent[23], an example of a perfectly inscrutable game that can not be understood.

This process of learning games through practice has come to be known as "theorycrafting". Thoerycrafting describes a systematic approach taken by communities of players, which helps them to generate a model for how the game works. The typical example of theorycrafting is from World of Warcraft[8], where players used empirical methods to develop theories and models for hidden mechanics [38]. However, this practice is widespread and can be found in the myriad of "unofficial wikis" that form a repository for theorycrafting knowledge (e.g. [56]). In some cases, players will decompile games in order to develop these models. For example the site Turnip Prophet[5], for Animal Crossing: New Horizons[39], helps players maximise returns on vegetable investments through code extracted from the game cartridge [55]. Thompson reports on players developing physics simulations to help them in Peggle[54]. In board games, the system is typically fully exposed to the player, and Rogerson [48] finds that players digitise board games in order to test strategies using digital tools and techniques[36]. This practice also means such games also serve as a convenient platform for developing AI algorithms [60].

Although theorycrafting might be seen as breaking the game, or cheating, it is also a form of participation [25] and a community activity [59]. Paul [42] argues theorycrafting reshapes play and centres the player as the expert, even over the developers. This kind of "instrumental play" is typically goal-oriented [2], and about maximising speed and efficiency (minmaxing), and typically associated with "power" players [53]. These players, as Paul observes, are like data scientists in sports, not just aiming to understand and model how systems work, but intending to exploit that model for an advantage [32, 42]. This approach also has been adopted by game designers themselves, as a way to automate testing of strategies at large scale[18].

Theorycrafting and other instrumental play appears relatively advanced, in that we might assume that players are already familiar with the core of the gameplay mechanics. However, it is an open question about how and when this kind of analytical thinking begins, and how players develop their approaches in the face of apparent complexity. Moreover, how do players engage with inscrutable games, how do they make decisions given limited feedback, and how do they understand success?

3 METHOD

To explore our research questions, we took a mixed-methods approach, using the case study of a game created specifically for this project. By creating a new game to use as a case study, it allows us to collect raw data about player interactions in the game, but also allows us to deal with a game much less complex than commercial examples of games we have discussed. In particular, given the complexity of the commercial games cited previously, and the number of interactions available to players and the number of ways feedback is presented to players, it would be very challenging to understand any link between feedback and player action.

We developed the game as a minimalist inscrutable game. The design intention was to create a game that was inscrutable and illegible, so that players could not easily determine a link between their actions and the feedback presented by game, but with a very small interaction space so we could observe exactly what players were doing in the game as they encountered it. As part of this, the theme of the game was important as we wanted to ensure players could understand the overarching logic of the game, without understanding the fine details of how their choices influence the system. The aim here was not to make the game impossible to play, but rather impossible to fully understand.

3.1 Non-League Football Supporter

Non-League Football Supporter (NLFS) is a mobile game for Android where players take on the role of a diehard supporter of a randomly generated football (soccer) team. Explicitly, this is not a major team, but a local semi-professional team outside the top 4 tiers of the English football league system ("Non-League"). There are thousands of such teams in England, typically with strong working class and socialist roots (e.g. supporter-owned FC United of Manchester[40]

and Prescot Cables FC[10]), that maintain a small, but loyal, dogged, down-to-earth, and eccentric fan base [35, 52].

In Non-League Football Supporter, we wanted to celebrate these aspects, and the narrative of the game is rich with reference to non-league culture. For example, players can choose to consume a "meaty drink", a reference to Bovril, a beef gravy drink popular among non-league fans (served hot, with or without milk), or bring along a "dog on a string", another common sight at smaller grounds.

NLFS is a single-player experience. On first loading the game, it randomly generates a team for the player to support, along with players and officials for other teams in a randomly generated league. Players cannot change the team they support (for realism). There is a short tutorial that introduces the basic interactions of the game and what information is displayed. Again, the point here is to not make the game confusing from an interaction design perspective, so this level of interface introduction is still necessary. Players can view a league table that shows the current standings, and they can see some stats about their own team (players, top scorers), and they can see some details about the next match (opponent, home or away, weather).

The player always attends every one of their team's matches, and before each game is shown a screen where they can select from a range of pre-match rituals (see Fig 1). This is the core mechanic in the game, and the only interaction the player can make. Players can select something to wear (team shirt, scarf,...), something to eat (pie, barm,...), something to drink (warm lager, fizzy pop,..) and something to bring (brolly, mardy nephew,...). There are five options, plus the option to do "nothing special" for each category. These kinds of rituals are exaggerated based on those common in non-league (e.g. see [19, 52]), and general superstitions in broader football culture[12].

Following this, the player watches a 1-2 minute live text-based summary of match events (Fig 1, Middle), in a style familiar to players of Championship Manager games. The match events are randomly generated from a list. The score is determined randomly based on the (randomly generated) quality of each team, and on the statistical distribution of real historical match results.

After each match, the player is given a short summary of the match, including score, randomly selected text analysis following sports journalism tropes ("Football was the winner at Bridge Park today…"), and players are shown results of other matches in the league.

There is a lot of randomness in the game, as nearly all content is procedurally generated. Nearly all textual content is generated from lists of words that generate very typical non-league dressing. For example, the leagues are called things like "Northern Counties Veteran Premier", teams are generated from random English-like names and common suffixes like "Stiggington Athletic" or "Tulthead Albion" and play at random grounds like "Mill Bridge" or "Station Square". In-match events and post-match summaries are drawn from lists of events and language typical in non-league coverage (e.g. teams "ground out a draw" and refs give out a lot of yellow cards). Secondly, there is randomness in play, as each team has random players with random skill levels, the result is determined randomly using these skills as a weighting, to give a scoreline consistent with the distribution of scores at this level. At the end of each season, teams are demoted and promoted, and player transfers

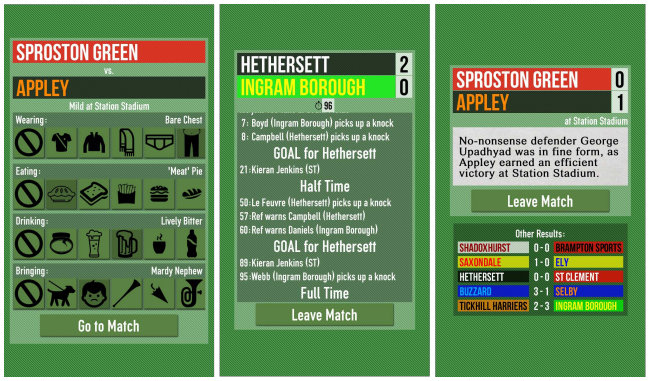

Figure 1: Screen captures of the NLFS interface showing the ritual selection screen, the live match view and the post-match result screen

and retirement happen at random. If the player's team leaves the league, an entirely new league is generated for them to compete in. There are thousands of potential leagues and teams can never be promoted or relegated out of the fictional pyramid. There is no win or lose state outside of individual matches and seasons.

Importantly, the game creates a rich and living game world, with players, teams and leagues. However, there is purposefully very little interaction offered to the player in engaging with this world. All the player can do is watch matches, see stats, and choose pre-game rituals. They are supporters, not managers or players. It is never claimed that players actions affect results and in all game literature the player's role is described as an observer, following and supporting their team. In this way, it shares some similarities with Blaseball[3], a community game where players follow teams in a fantastical and evolving derivative of baseball, however NLFS maintains focus on individual supporter rather than community 'paragame' [6].

The game is open source, and available on the Android Google Play free of cost.

3.2 Study Design

NLFS provides a useful platform for exploring how players cope with illegibility in game design, and formed the basis of a mixed methods study in two parts.

The aim of these studies is to help answer the core research questions:

(1) Can inscrutable games engage players effectively?
(2) Do players make meaningful decisions in inscrutable games?
(3) If so, how do players attempt to understand the systems in inscrutable games?

There are two approaches used in this project. Firstly, we present a quantitative study of player interactions in the game, drawn from the collected data of all players who consented to have their gameplay data recorded for the purposes of the study. This helps give an understanding of what players do in the game, and how they change what they do over time.

This is complemented by a qualitative study where a group of people were recruited to play the game over a period, then

discuss their experiences with a researcher, to help give insights and explicate on decision making processes as they played the game.

In both studies, the design and data collection was approved in advance through the ethics process at the University of York, all data collected was necessary for each study and stored according to GDPR regulations, securely through the University of York.

4 PATTERNS OF PLAY

Upon launching the game, players are given the option to participate in the study. A link provides an information sheet and full details of the study. It is voluntary, and opt-in. At any time later, players can opt out of the study by selecting the option in the settings menu, or by contacting the researchers. If they opt in to the study, the game sends an encrypted message to a server at the University of York each time they interact with the game by pressing "Go to Match".

The data collected comprises a unique one-way hashed player id, the rituals they selected, the team they were playing against, the result of the match, the time spent on the ritual screen (ms), a timestamp, the player's team league position, week and season number. No personally identifiable information was recorded.

Data was collected on a rolling basis for two years from the game's public release. For the current paper, that includes data from 4th April 2018 to 3rd April 2020 inclusive. The game's release was announced on social media, and through a limited advertising campaign on the Google Play store. Participants could opt in to the study on their first play of the game, there were no additional incentives for participating or not.

As we describe the analysis, the term "player" is used to describe the human player, and "match" a single unit of play, which allows the user one opportunity to interact through a selection of four "rituals" each offering six options, including "Nothing special". In the interface, the ritual selection is maintained from the previous match.

In the sample collected over the study period, 1493 unique players played at least one match, and 51,803 total matches were played. The median number of matches played by each player is 4. The most prolific 31 (2.1%) players were responsible for 50% of all games played, and 317 (21.2%) players only played once. This pattern follows a power-like distribution typical of game engagement [26, 27] where a small number of players are responsible for the majority of game events. In our sample, 4 players each played over 1000 matches, which we estimate as taking an equivalent 25 hours of play across sessions. Given this expected pattern, the long sample period is necessary to capture a broad range of play activity styles.

Given the distribution of play activity between players, the data is skewed by the few "power" players who produced the majority of game plays, even though they make very few choices. These power players are interesting as a curiosity. For example, the most active player only made 2 ritual changes in the last 5,500 of their 8,621 matches, swapping their nephew for an umbrella and later for a vuvuzela, and has been drinking beer for 390 consecutive in-game years.

Since we found that players take relatively little in game action after their first 200 matches, we examine only the first 200 of those matches for each player, in order to keep the focus on the early phase of becoming familiar with the game where most interactions occur. This includes the complete play history for 93.1% of the players.

4.1 Can inscrutable games engage players effectively?

To answer this question we can look at the statistics for how players interacted with NLFS. In particular, by specifically looking at meaningful interaction through changing rituals in the interface. Changing each ritual is a unique interaction in the interface, where the alternative is to skip, effectively changing 0. In the case of the first match, we compare against the defaults ("nothing special").

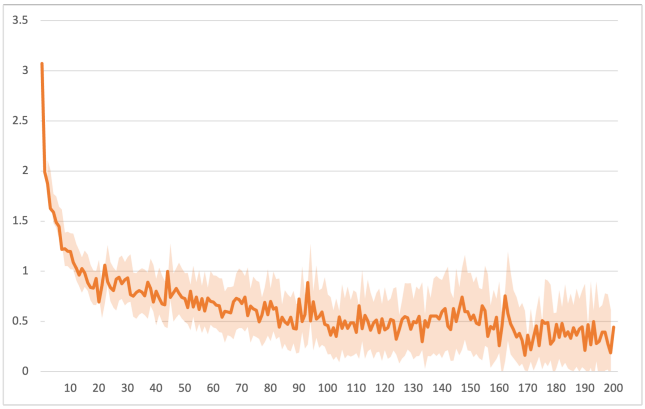

Figure 2: Plot of mean number of interactions across all players after *x* plays of NLFS. Shaded area shows 99% confidence interval

Figure 2 shows the mean number of interactions (changes to rituals) that players made over time. For example players change on average around 3 rituals in their first match, but after playing 100 times tend to only change 1 ritual every other match. This can be expected as players explore the interaction space of the game systems early on, then settle into smaller variations the more they play.

This is also observed when we look at how long players take to make decisions about rituals. This is recorded as the number of milliseconds between being presented the ritual selection screen and making a decision (see figure 3). This includes cases where players decide to make no changes. Because this is open ended, some players took a long time (up to 23 hours in one case), so here we look at the median time taken to make a decision. In the first match, this is approximately 32 seconds, the second match 11 seconds, and by the 10th match played, the median time taken hovers at around 1.5 seconds. After 200 plays this is usually less than 1 second. This is so fast that we can assume there is little thought going into the decision to adjust ritual selection or not, from the first few dozen matches onwards.

Note that in both the number of changes, and the time taken, there are slight bumps around match 23, which is likely related to each in-game year lasting 22 matches, and the new season implicitly prompting further consideration of ritual choice. This is less pronounced in matches 45, 67 and above for following seasons.

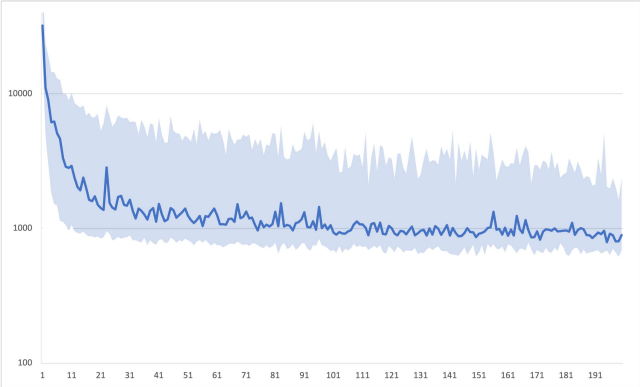

Figure 3: Plot of median time (ms) taken (*log(y)*) to choose rituals after *x* plays of NLFS. Shaded area shows Q1-Q3 quartiles.

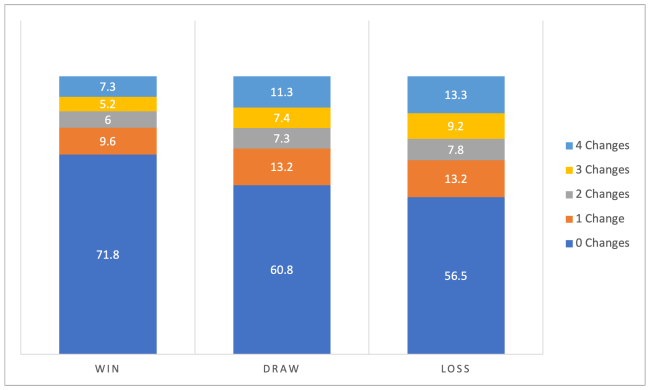

Figure 4: The mean percentage of changes made by all players after a win, loss or draw.

Although there is a sharp drop in engagement after the first dozen or so matches played, this pattern of interaction shows that many players still continue to play the game, even merely as observers. The variance in interactions and time spent deciding on rituals demonstrates active decision making, even at a low level, after continued play. This is interesting mainly because there is no effect of these decisions. Players are not receiving any meaningful feedback from the game, but continue to engage.

4.2 Do players make meaningful decisions in illegible games?

Although we know players interact more earlier than later, what is the nature of those interactions? To answer this, we look for evidence that players are making meaningful or "rational" decisions in spite of the system being unsolvable, and presented this way.

One of the only feedback events in the game is the result or outcome of each match - i.e., whether the player's team win, lose or draw. It is reasonable to suggest that the player will make different decisions based on that feedback, even though there is no narrative causal link between action and outcome (e.g. eating a sandwich -> team wins), simply because ritual selection is the only interaction in the game. In this way, it serves as a measure of their belief they may have an impact on the result of the game based on their decisions.

Figure 4 shows how many rituals players changed in the match following a win, loss or draw. The result of the previous match had a significant effect on the number of rituals changed (χ^2 $p < 0.001$, $N = 30,177$ matches with a previous match for comparison, capped at 200 per player). Although the most common choice is to not change anything, split by result different patterns emerge along reasonable lines. When players lose they change more rituals (13.3% of the time changing every ritual) than when they win or draw. Therefore we can say that players are not acting randomly while playing the game, and are using match results as feedback to inform their decision making.

To take this a step further, we look at "streaks" of consecutive wins or losses. It is reasonable to expect that a rational player continues to change fewer rituals when they keep winning, and may make more sweeping changes if a losing streak continues. The following chart shows the mean number of changes players made to their ritual selection, after experiencing a certain number of consecutive wins, losses or draws.

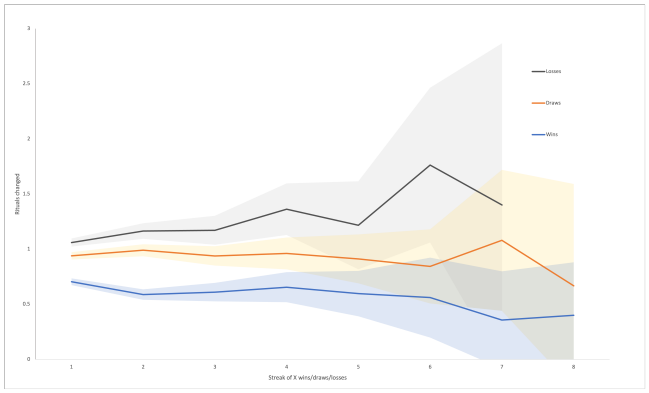

Figure 5: The mean number of changes after a streak of *x* wins, losses or draws. Shaded area is 95% confidence interval

Note that long streaks are statistically increasingly rare, so noise increases as we go right, as noted by the shaded areas reporting 95% confidence intervals. For example only 1 player ever had a streak of 11 wins in a row, and this same streak was also the only time there were 10 wins in a row. For this reason, we have excluded streaks which occurred fewer than 5 distinct times in the data - (streaks of more than 8 wins, 8 draws or 7 losses). Despite this, the trend is that for winning streaks the players change fewer rituals the further the streak goes, and for losing streaks they change more. This again tells us that players appear to be behaving "rationally" based on the results of matches, and also changing behaviour based on sequences of results in the game.

The game offers players the choice of what to wear, eat, drink and bring to each match, for example a lucky scarf, meat pie or "mardy" nephew. Further evidence for rational engagement with the game (i.e. not just random selection) is that the choices are not evenly distributed. For example, "lively bitter" is selected in 34% of

all matches across the sample, more than three times the popularity of the "meaty drink". Similarly the "team shirt" is more than twice as popular as the "lucky pants". This effect of the narrative is explored in the second study but further demonstrates active decision making during play.

4.3 Summary

Study 1 tells us that players are changing behaviour as they keep playing the game, and that these changes are informed by feedback from the game, in terms of match results. It also shows us that interaction reduces quickly over time, and that the longer a player plays, the fewer changes they make to their strategy.

This could be a typical pattern of interaction with any game. However, NLFS is intentionally inscrutable - there is no direct feedback from player action in the game (choosing ritual) to demonstrate whether action had effects. All player action can be random without any effect on the performance of their team. Despite this, players seem to initially associate the feedback of game results, magnitude of that result, and streaks in results, to help inform decisions about changes to rituals. In this way, players appear to be developing theories for how the game works that informs their strategy while playing, at least at first. It is also interesting that players seem to reduce interaction over time, after the first 15 matches changing less than one ritual per match, yet continue to play for sometimes thousands of matches making only occasional choices in a game where there is no relationship between player choice and outcomes. It is important to note that there are no explicit measures of whether players are actually enjoying the game, or, in other words, having fun. We might assume so given the continuous engagement, but we cannot determine motivation(positive or negative) from activity data alone.

5 RESPONSE TO INSCRUTABILITY

The first study gives some insight into how players engaged with the game in broad terms, but creates more questions about why players behave in certain ways in the game. Given the game is intentionally inscrutable, it is valuable for us to understand the experience of players in their own words, to understand the factors that led to their decision making, to complement the analysis gained from looking at play data.

The second study took the form of a series of semi-structured interviews with players. A flyer for the study was generated and shared on social media, and through sharing with gaming societies at the University of York. Participants were selected based on their access to a compatible device, willingness to engage in play and interviews, and basic games literacy (e.g. were familiar with playing games in general). Participants were given information sheets about the game and the study, and once they agreed to participate, they were sent a link to the game, with instructions to install and play for "at least two seasons". Each participant in the group was offered a £10 voucher for an online store by way of thanks.

After a few weeks, each participant was invited to an interview with the primary researcher, optionally in person or remotely over video conference. Interviews lasted between 10-20 minutes depending on the participant, and all followed a semi-structured schedule that asked them to talk about how they approached different aspects of the game. Follow up questions were asked as necessary to get additional clarification or to follow up on comments. Participants could opt-out and withdraw from the study at any time.

All interviews were audio recorded, and transcribed by the primary researcher. There were 8 participants, 3 who identify as female and 5 who identify as male. Ages of participants ranged from 23 to 45. Questions focused on understanding how participants approached the game, what strategies they adopted, and in particular, how they made decisions when faced with playing an inscrutable game. The interview transcripts were analysed following a reflexive thematic analysis approach[4]. This approach is useful because the researcher conducting the interview and analysis was co-designer of the game, and participants were aware of this ahead of their interviews. As such, the conversations could be very rich around the game mechanisms and the player interpretation, but also through this proximity the researcher could pick up on subtle insights from participants both during the interviews and the later analysis. At the end of the interviews, participants were given additional time to ask questions about how the game worked, and the reasoning behind different design choices. The analysis followed an inductive bottom up approach - there was no attempt to fit this to existing theories, and the focus was on understanding what it was like to be a player of NLFS, and how their experience changed over time.

Following the iterative process of finding meaning through coding and reflection [4], we developed four themes that encapsulate different aspects of the player experience in NLFS. *Games are Problems to be Solved*, *Treasure Hunts and the Search for Clues*, *Coming to Terms with Unsolvability*, and *Investment in the Grit and Relentlessness.*

5.1 Games are Problems to be Solved

Most of the interviews started with a discussion of how participants approached the game, and in nearly all cases participants talked about how they approached the game, and games in general, as something that it was possible to "win". There was a common assumption that there was some correct combination of rituals that would make this happen ("*I thought, it's only a small game so there's gotta be some kind of system behind this....It can't be that hard to work out*" [P5]). This typically meant there was some kind of initial strategy to their play, but the adherence varied.

Some participants approached it "*like a combination lock*"[P8], changing one thing at a time, going through the ritual options in a highly systematic fashion ("*I knew I could sit there, and math it out.*"[P6]), in some cases (initially) ignoring the theme and narrative of the game as dressing ("*it was systematic....I was doing it logically as opposed to just emotionally*" [P5], "*you can read the fluffy stuff and you can read all the text, but realistically, it's ones and zeros underneath it*"[P6]). A couple of the players realised that even for a simple game there was some complexity, as there are 1296 possible combinations of ritual yet only 22 matches in a season: "*I started out trying to figure out like an algorithm, and then realizing there's way too many to really figure out... I would totally get pen and paper up and see what combinations gave what results and look at the analysis of that and see if I could crack the code. But it would take forever to do.*" [P7], "*it would be five by five by... I mean thousands of leagues before you can work it out*" [P6]. Some participants also felt they

wanted to do this but missed their chance or lost data: "*having gone down to the middle of the second tier down I thought 'there's no going back'...by that point, I'd missed any chance to correlate any information.*" [P4].

5.2 Treasure Hunts and the Search for Clues

Where strategies were ineffective, some of the more persistent players tried to find clues, or additional feedback from the game to see if there was anything that could give them insight into how to have more success. For example, "*some of the words in the match description would match a word from the list that (.) they kept saying that 'the meaty defender'. And then there was the meaty beverage. Maybe that's a hint, maybe I should pick that for the next match. But that never seemed to work*" [P2]. One player even went searching outside the game, for clues hidden online: "*for one of the games. I thought there's gotta be something in this… halfway through the season I changed it all. On the Google Play store, there's a picture of that screen of what you can choose. So I chose them. And I did absolutely terribly.*" [P5]

A part of this wider search for clues was a growing suspicion in some players that the game was not honest, and that it was somehow manipulating them: "*I got up a league… I thought that was like a kind of bait to keep you playing*" [P5], or were suspicious that the game changed based on their success, "*if I stayed on the same thing for a while I would automatically think I need to move*" [P7], "*you can't stick at one thing for too long I've found because if you keep using the same thing, it will just go 'no'. You can't use that again because your team is gonna lose*" [P5], and justifying how "*it changed. It has to otherwise you just find the combination and then win the league.*"[P3]. One participant was looking for a connection between the design of the game and the research being conducted ("*initially I thought, oh, this is gonna be one of those where no matter what I choose... it's just like a predetermined score and these things measure my reaction*" [P6]).

Other players responded to the breakdown of strategy by adjusting their theory. For example, by watching the league table players realised that different teams were different quality, so coming to new understanding of what counts as a good result: "*Once I felt my team kind of sucked, I go, okay, success isn't just winning big, success is kind of gauged based on who you're playing and how it finishes. It became like a real sports fan's experience that way.… if I had a one-one draw against the top team in the league, I think, okay, I'll stick with that combination. That was a really good match*"[P2]

5.3 Coming to Terms with Unsolvability

There is no link between player input and team performance in NLFS, so analytical approaches to playing are doomed to fail. Players responded to this failure in interesting ways. For some players through feelings of liberation "*I don't know if any of the changes matter at all. So let's just screw it up*"[P1], others through despair: "*It was progress to entropy. I think the more I played, the more chaotic it felt. You know, initially I was just interested in what my choices were. But less and less as they started to yield nothing tangible. I can't see any correlation between my choices in the game, so it just became all, you know, chimpanzee bashing a keyboard*" [P4], "*towards the end of the season, I felt like it was just... nothing was working for me.*"[P7] "*I got the feeling from the end of the second season that there was nothing I was gonna do to work this out.*" [P6]

As a result of this, some shifted their expectations about the game entirely: "*After doing the examination of the impact of the combination and sticking to the one combination.... I got to starting actually reading what was happening. I sort of settled back a little bit and stopped trying to focus highly on one aspect.… I realised sort of (.) I thought I was having very little impact, but I was enjoying reading what was going on and just enjoying it…*" [P8]

5.4 Invested in the grit and relentlessness

NLFS has a rich cultural context in local football that is connected with players' own experiences. "*in [my town], you go to the town game and you'd see the blokes in the flat cap with their dogs on the string drinking their Bovril, roll-up liquorice cigarettes. I thought, this is exactly non-league football.*" [P6]

This narrative became increasingly central for many participants, who talked about getting caught up in watching the game as a spectator "*I think you can't help yourself if your competitive mind is, you know, a big win is like, YES! Even after you just said this is a silly game. Big losses, similarly … BLOODY HELL, this is going nowhere*" [P4], and changing the nature of their approach to the game.

This narrative connection drove some players' decision making, to be based on personal preference,"*I started also making decisions in what I found most annoying or disgusting*" [P1]. "*Well I started off with things I like... So I didn't put Bovril because I don't like Bovril. I like dogs. [I chose] dogs a lot.*" [P3]

Fascinatingly, some players talked about this being a change in their attitude to the game. "*it went from sort of like my enjoyment of video games to my enjoyment of roleplaying games because I took a role within a character and played it like that.*" [P8] but also explicitly in terms of building a character and using them as a proxy for making game decisions. "*Bring the dog along. He's always good fun to bring to the match, and I never want to bring my nephew. I brought him to two matches, we lose each time, He's a pain to even deal with while we're at the match*" [P2]. "*It almost became my character's tradition to go... this is everything he wore. This is everything he did. Regardless of the weather*" [P8]

5.5 Summary

This study adds depth and richness to our understanding of motivations of the players while playing NLFS, but also how their decision making approach changes, and the importance of narrative as a motivation to continue playing. As seen in the first study, most players seem to naturally follow an analytical approach to "solving" the game, sometimes going to great lengths based on an assumption about how games typically work. However, increasingly over time, the narrative of the game often provides enough motivation. The relationship between player action and game result was not as important as how that result fits with the story of the game as they experience it.

6 DISCUSSION

In game design, the notion of "appropriate challenge" is received design wisdom. It is proposed that a game should not be too far beyond the player skill as to be frustrating, but also not too below

the player skill to be boring. Aside from more broad critiques on the theory of "flow" as a desirable state to work towards [50], it is questionable whether there is such a thing as a game that is too frustrating, or a game that is too boring for all players. For example, Klarkowski et al. [28, 29] found players made their own fun and rewards in intentionally "boring" game conditions. The genre of idle/clicker games is perhaps the best example of this, as games that usually have no failure or success states at all [16]. Indeed, games being trivially easy is motivating to players even if they don't believe it themselves [34, 49]. Non-League Football Supporter, as an inscrutable game, muddies this water further. There is no connection between player action and game result, both mechanically and narratively, as players are explicitly spectators. Yet still, players presume the opposite and demonstrate structured and empirical approaches to uncover how the game works and how best to act. They develop theories for success, change more when they are on a losing streak, attempt different combinations in patterns and look for clues and evidence in unusual places.

This shows that people do attempt to figure out how to win games, but more interesting is what happens when they can't figure it out, and how their relationship to the game, the narrative and the mechanics changes in this situation. In particular, players' reframing of what counts as a success, and reappraising their relationship to the game and the perceived value, as they come to terms with the inscrutability of the core game system. In NLFS, although the logic of the game is inscrutable, the logic of the narrative is entirely legible to players. They are playing as supporters of a terrible football team. This narrative provides the route for engagement with the game, and we find players place more emphasis on enjoying roleplaying. Indeed, the longer a player engages with the game, the less they actually do in it. After the first few dozen matches, the interactions are likely just noise - players do not seem to be making meaningful decisions. However, many still continue to "play" for a very long time after this point. The value in the game for these players is clearly not in terms of their own feelings of skill or strategy. An interesting comparison here is the game Blaseball[3], another title where players have few ways to affect the performance of their team, but instead the focus is more on the communal stories of fandom as narrative instrument[31], than individual mechanics that make up the game or the quantifiable results of the gameplay.

6.1 Limitations and future work

Although this study presents an interesting case study and exploration of illegible game systems, it is important to recognise that this is a single game, and therefore difficult to generalise findings across all games. It is also distributed as a free mobile game about football, which skews both audience and expectation based on the platform and genre. However, NLFS still provides a useful picture on how players approach games because of its extremely simple mechanics and structure. With more mechanics and complexity it would be difficult to unpick the relationship between player actions and game feedback.

In our qualitative analysis, our participants belong to the middle group of players. None were in the "long tail" minority of players who engaged over dozens of hours, and since participants were asked to play for a few seasons, none were in the group that gave up after a few plays. This means that although we get a rich understanding of the processes players went through in playing the game, there could be further insight around reasons for stopping or, especially, continuing to play.

Further work could build on this study by exploring illegibility across genre and platform, and uncovering how this relates to different expectations. There is also opportunity to further understand the relationship between game narratives and the notion of challenge, and especially how players engage in role playing and story generation in response to procedural hostility [28].

7 CONCLUSION

This paper has investigated how game players approach "procedurally hostile" [57] systems and how they come to terms with genuinely inscrutable game systems that offer little meaningful feedback on player decisions.

Non-League Football Supporter is introduced as an inscrutable game, where the player actions have no mechanical or narrative relationship to the implied success outcomes of the game (teams winning matches). This is investigated through a mixed method study, including quantitative analysis of tens of thousands of games played, and a rich qualitative study with players themselves.

The outcomes of this study show a surprising persistence of players when trying to understand game systems, often taking empirical and experimental approaches to solve games as problems. This also speaks to a general assumption that games can always be solved or understood, but also the inherent value in the process of figuring it out [25, 30]. Despite there being no system to figure out in NLFS, the process of coming to terms with this reality shows how value can shift to be understood in terms of narrative, with some players treating the game more as storytelling or role play, which may help explain why some players are willing to dedicate dozens of hours actively playing a game where their actions have no effect. The findings of this study has implications for game designers, as it helps us understand player response to hostile and obscure game systems, but also to reaffirm that games do not actually need to always be perfectly legible, as players shift their motivations around games, and how they enjoy and understand them.

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