The Philosophy of Computer Games Conference, Malta 2016

A Theoretical Framework of Ludic Knowledge: A Case Study in Disruption and Cognitive Engagement

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Abstract

This paper presents a theoretical framework of ludic knowledge applicable to game design. It was developed as a basis for disrupting player knowledge of 'normative' game rules and behaviours, stored as different types of ludic knowledge (intraludic, interludic, transludic, and extraludic), with the aim of supporting a player's cognitive engagement with a game. The framework describes these different types of knowledge and how they inform player expectation, engagement with gameplay choices, and critical responses to games before, during, and after play. Following the work by Howell, Stevens, and Eyles (2014) that presented an initial schema-based framework of player learning during gameplay, this paper further develops the framework based on its application to the design and development of the commercial game *Amnesia: A Machine for Pigs* (The Chinese Room, 2013); a first-person horror-adventure title released for PC. While the theoretical framework of ludic knowledge was developed to support the concept of 'disruption', it can also be applied as a standalone tool usable as a basis for critical analysis of how players engage with and talk about games more generally.

The Foundation of a Theoretical Framework of Ludic Knowledge

Knowledge as it relates to any one particular game has been previously suggested to be separable into three categories (Howell, Stevens, and Eyles, 2014), based on how that knowledge is contextualised relative to that particular game. *Intraludic* knowledge relates to the particular game being played, *transludic* knowledge relates to multiple other games that an individual may have played in the past, and *extraludic* knowledge relates to any life experiences outside of playing games.

Each of these types of knowledge can be coupled with a *memory* type, based on the division of long-term memory by Tulving (1985a, 1985b) into *procedural memory* (of actions, processes, and sequences), *semantic memory* (of facts and concepts), and *episodic memory* (of personal lived experiences). This provides a total of nine different types of ludic knowledge that a player may utilise during gameplay (Howell et al., 2014:11).

As an example, while playing a driving game, such as *Gran Turismo* (Polyphony Digital, 2013), players are constructing intraludic semantic and procedural knowledge about how the cars in the game handle (semantic) and the processes and actions required to drive them (procedural). The game depicts cars and race tracks that players may have experience of in other games, allowing them to make use of their transludic semantic and episodic knowledge of those game components. If players have real world driving experience, they may also use the associated extraludic semantic and episodic knowledge to further inform their in-game decision making, such as when to change gear based on the sound of the car's engine or the gradient of the driving surface.

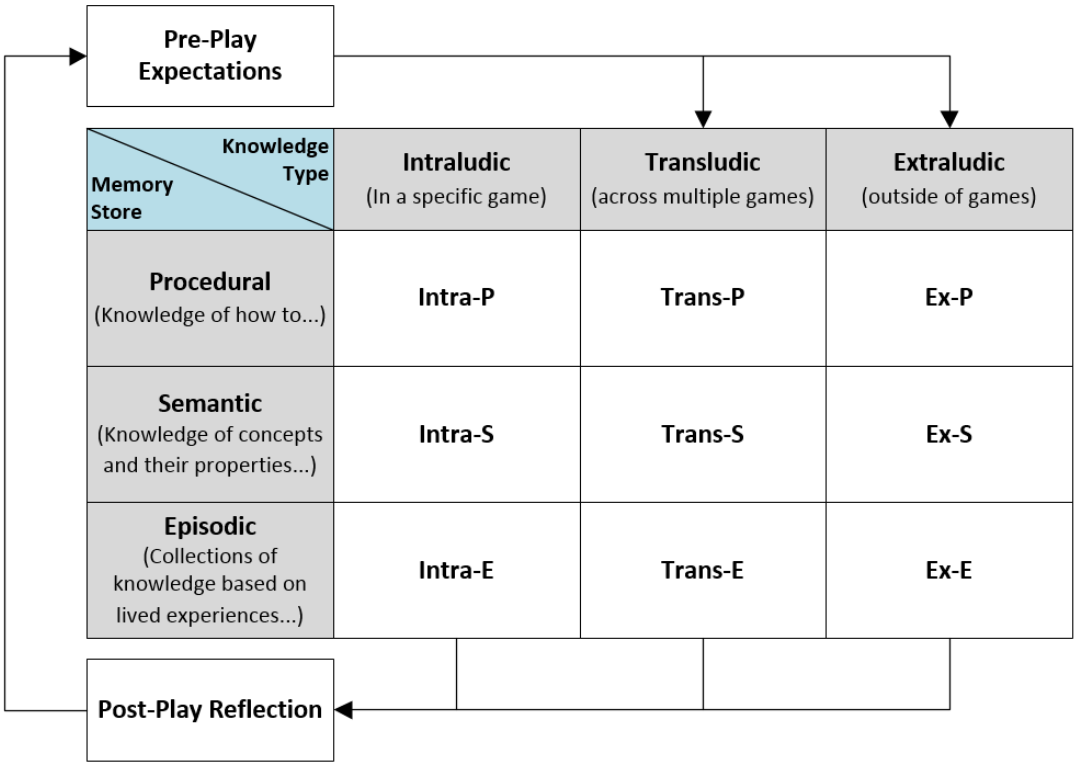

Figure 1: Basic structure of ludic knowledge types, adapted from Howell et al. (2014).

While this basic structure of ludic knowledge outlined in Howell et al. (2014) can describe the knowledge types involved in a wide range of gameplay activities) (Figure 1), it fails to differentiate between knowledge that is applicable to *many* different games (e.g. the semantic knowledge that the 'Start' button is the default pause button for most console games) and knowledge that is applicable to a smaller set of games (e.g. the semantic knowledge that the 'Phoenix Down' item revives characters from death in the *Final Fantasy* series). Both of these cases can be described as making use of transludic knowledge but the latter example is much more specific in terms of the context in which it is useful. This type of knowledge, contextualised within a specific game series or franchise, or applicable to a small subset of games rather than many different games, can be termed *interludic* knowledge; knowledge that can be transferred *between* specific games but loses its relevance outside of those games. Furthermore, the application of these ludic knowledge types in Howell et al. (2014) is primarily focused on how players utilise them during active gameplay, with little attention to how they inform post-play critical reflection on the play experience, or how newly constructed ludic knowledge feeds forward into pre-play expectations of future games.

This paper uses evidence gathered from a post-release qualitative player study[1] of *Amnesia: A Machine for Pigs* to present a more robust theoretical framework of ludic knowledge. Firstly, the framework incorporates the concept of *ludic context* as a way of explaining the order in which players recall and utilise different types of ludic knowledge. In doing so, the new interludic knowledge type is incorporated into the existing knowledge type structure. The framework then expands the concepts of 'pre-play expectations' and 'post-play reflection' (Figure 1) to include a number of different extraludic stimuli that are evidenced in the player study to effect cognitive engagement and the player experience more broadly.

[1] Data consists of all 304 forum thread pages publically available on the game's official online discussion forum between January 6th and January 8th 2014. Analysis was conducted via King's (2004) Template Analysis methodology.

Disruption of Ludic Knowledge for Supporting Cognitive Engagement

Many typical game challenges are primarily concerned with providing opportunities for players to experience feelings of achievement and performative skills mastery. This type of challenge tends to operate within a set of normative conventions, dependent on the game type. For example, conventions of the platform game type may include mechanical consistencies such as the predictable jumping trajectory of the player character. Challenges in platform games are based on the player's ability to master their performative control of this core game mechanic. The mechanic itself remains consistent while the context in which it must be successfully performed changes. The 'boss game' sub-genre, exemplified by titles such as *Shadow of the Colossus* (Team Ico, 2005) and *Furi* (The Game Bakers, 2016), further illustrates a focus on achievement and mastery that requires improvement through rote repetition and pattern recognition. Howell et al. (2014) argue that this type of challenge is based on a gradual process of *incremental accretive learning* and provides little opportunity for players to experience more cognitively engaging activities such as creative thought and problem solving.

Games which are designed to maximise the chances of players attaining feelings of achievement and performative skills mastery can be described as *player-supportive* games. Such games are likely to include in-depth tutorial levels or areas to ensure players fully understand the game's mechanics and are likely to have a structure that promotes incremental accretive learning by the player. They may also include additional types of player support, such as on-screen button prompts or instructions to minimise player failure. Games that lack these supportive features and require players to learn how to play and how the game systems function through a process of trial-and-error, can be described as *player-unsupportive* games; for example, *Minecraft* (Mojang, 2011), *Rust* (Facepunch Studios, 2013), or *Scribblenauts* (5th Cell, 2009). Importantly, these player-unsupportive games still have *stable* systems that players can discover and construct reliable knowledge about. Once players have, for example, learned how to craft items in *Minecraft*, the system does not change. There is an initial period of heightened cognitive engagement as players experiment and construct knowledge about the game's systems but this then gives way to a different type of gameplay once the systems are understood, with players performing the learned actions and processes with little additional cognitive effort required.

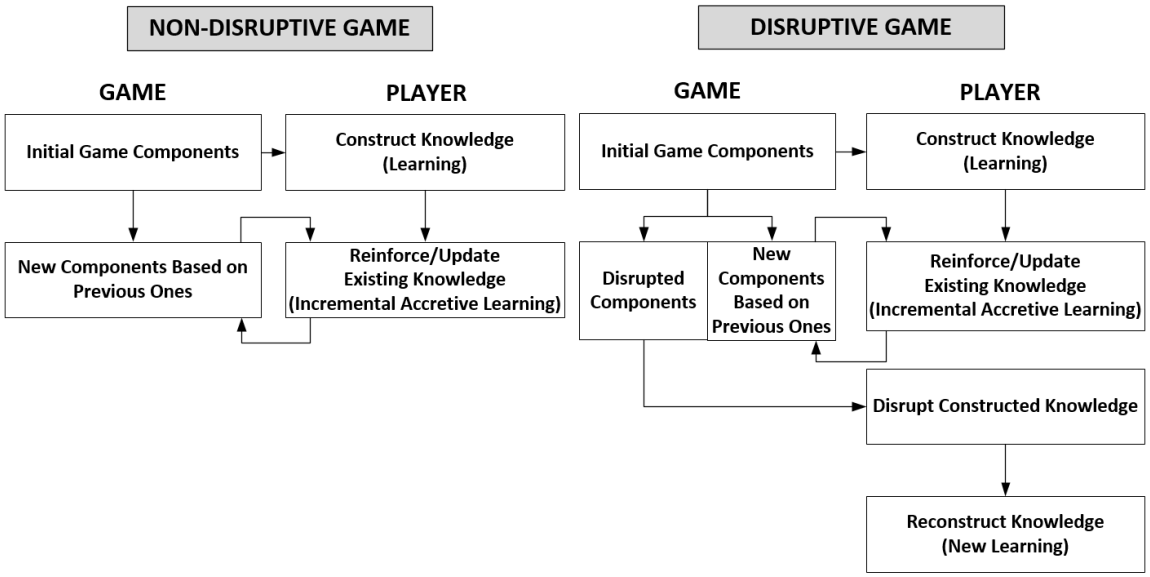

Figure 2: Non-disruptive and disruptive games in the context of knowledge construction and reconstruction.

Disruptive games (Howell, 2011, Howell et al., 2014) meanwhile aim to maintain a more consistent level of cognitive engagement throughout the play time of a game by making changes to how game systems function at different points during play (Figure 2). By introducing game components that disrupt normative conventions and established player knowledge, or that disrupt game rules or

mechanics previously introduced in the game, the player activity is altered. Rather than attempting to 'master' a particular skill or beat a particular game level through repetition and gradual incremental improvement of performance, they are challenged to overcome a problem requiring a new period of learning, creative thought and, depending on the particular context, use of their wider knowledge and wider skills. The player is required to cognitively engage with the game at a deeper level than they may have otherwise, because the game systems are *not stable* and may change. Disruptive game components can be deployed alongside non-disruptive components as frequently as necessary in a game to encourage different degrees of cognitive engagement. Multiple instances of disruption during the course of an individual game provide multiple opportunities for players to experience heightened cognitive engagement. However, it is likely necessary to retain non-disruptive components to provide some opportunities for players to maintain feelings of achievement and mastery over *some* components of the game. If too many game components are disrupted simultaneously, the new learning that players would need to undertake in order to understand how to continue playing may cease to be enjoyably engaging and become confusing or frustrating.

Disruption was applied to the design and development of *Amnesia: A Machine for Pigs* through the inclusion of specific disruptive game components. Some of these specific components have been previously presented in Howell et al. (2014), however, the focus of the current paper is on the use of disruption as a mechanism that triggers player activity and discussion, providing evidence of cognitive engagement with a game as well as evidence to support the theoretical framework of ludic knowledge.

Ludic Context during Encoding and Recall of Ludic Knowledge

When a player is playing a new game for the first time, all knowledge that they construct about that game, its content, mechanics, and systems, is initially constructed as intraludic knowledge as it is only relevant to one specific game. This knowledge only then becomes transludic or interludic knowledge through being recalled during the play of *other* games and thus by becoming relevant to more than the one original game that initiated its construction. The likelihood of knowledge being recalled outside of the original game in which it was constructed is dependent on how that knowledge was encoded. Encoding specificity theory (Tulving & Thompson, 1973) states that knowledge is encoded along with contextual cues (e.g. the environment in which it was encoded, or the action being performed when it was encoded). Knowledge encoded in this way is then only able to be recalled if there is a sufficient match between the encoded contextual cues, and the contextual cues available in the recall environment. Applying encoding specificity to ludic knowledge types affords the suggestion of a *cue-dependent order of recall* during gameplay based on *ludic context relevance* – a progression of memory recall from the most contextually relevant ludic knowledge (i.e. the immediately relevant intraludic knowledge) to the least contextually relevant (i.e. extraludic knowledge from outside the context of games).

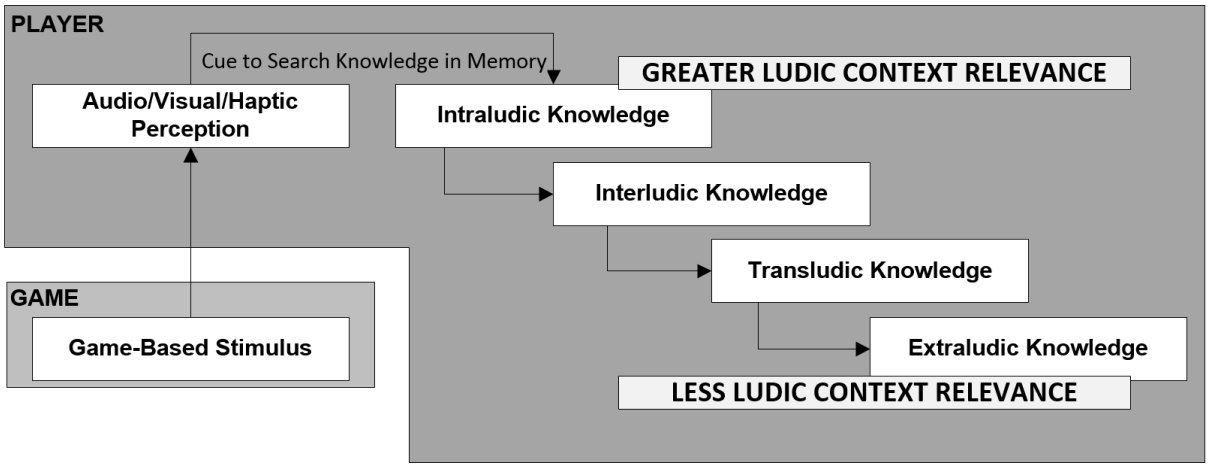

Figure 3: Progression of recall based on ludic context relevance.

Figure 3 presents the order of recall in response to perception of an in-game stimulus (i.e. a 'cue'), from greater to lesser ludic context relevance. If a player encounters an in-game stimulus (e.g. a zombie enemy in a role-playing game) that they have previously encountered in the same game, then their existing intraludic knowledge may be sufficient to understand and respond to it. If not (e.g. if the player's response does not have the desired result) then players may refer to interludic or transludic knowledge relevant to combating zombie-type enemies in other games. If these knowledge types also do not provide appropriate information, then the memory search may extend to extraludic knowledge, such as knowledge acquired from other zombie media, such as literature or films. Any memory query that requires processing beyond the most immediately contextually relevant intraludic knowledge requires additional cognitive engagement from players. Thus, game components that disrupt the reliability of intraludic knowledge (and possibly interludic and transludic knowledge as well) can provide opportunities for heightened cognitive engagement and more opportunities for players to experience associated cognitively engaging activities (e.g. creative thought, or problem solving).

A player's transludic knowledge will have varying degrees of ludic context relevance, depending on the game content or game mechanic it is related to. For example, in *Amnesia: A Machine for Pigs*, the player-character carries an electric lantern that can be used to illuminate the game environment but may also attract enemy attention. Many contemporary first-person horror games make use of a similar lantern, flashlight, or other handheld light source that players use to help navigate the game world. In the context of this particular gameplay mechanic, games such as the *Amnesia* series, *Outlast* (Red Barrels, 2013), *Kholat* (IMGN.PRO, 2015), or *Slender: The Eight Pages* (Parsec Productions, 2012) all have strong transludic similarity. These games also share transludic similarity in relation to the 'lantern' mechanic with games such as *Alan Wake* (Remedy Entertainment, 2010), however, the similarity is weaker due to the different purpose served by the mechanic; *Alan Wake*'s flashlight is not actually necessary to see the game environment for most of the game as there is adequate environmental lighting, instead functioning as a core feature of the game's combat.

The more games that players have prior experience of, the more opportunity they will have had to develop transludic knowledge and an understanding of transludic similarity. This means that ludic knowledge content differs significantly between different player demographics (e.g. between casual players and frequent players, or between younger and older players). Different groups of players will have different contextual frames of reference with which to understand the game they are playing.

Spatial and Temporal Components of Ludic Context and Player Expectation

Context refers to "that which surrounds a target, whether the surrounding is spatial, temporal, or meaningful in nature" (S. M. Smith, 1994:168). Ludic knowledge, particularly related to digital games, has two forms of spatial and temporal ludic context; the context of the *virtual* space and time that the game takes place in, and the context of the *real-world* space and time in which the player is playing. Virtual spatiotemporal context forms part of a player's intraludic knowledge, while real-world spatiotemporal context forms part of a player's extraludic knowledge. Meaningful context is dependent on the individual player's knowledge *schemas*, defined as networks of information configured in memory based on grouping in space and/or time, or other observed contextual or meaningful similarity (Bartlett, 1932; Lindley & Sennersten, 2008; Martin, 1994; Rumelhart & Ortony, 1977). The meaningful connections the player has formed between different concepts and previously experienced virtual and real-world spatiotemporal contexts in memory will affect how they interpret the meaningful context in which a particular game, or game component, is presented.

By being aware of the possible existing ludic knowledge, experience, and associated expectations that players may bring with them to a game, designers can create products that co-opt or subvert those expectations for different effects. This may be through simply appealing to an older demographic of players' memories of early gaming experiences, as seen in games such as *Evoland* (Shiro Games, 2013),

which shifts its virtual spatiotemporal context and its game mechanics to reflect different real-world time periods and their associated technological advances. Conversely, games such as *I Wanna Be The* Guy (O'Reilly, 2007) and the *Kaizo Mario World* ROM hacks (Takemoto, 2007) subvert player expectations frequently and with little opportunity for players to foresee or react to the subversion, usually resulting in unavoidable deaths and restarts (such games have been previously described as *abusive* by Wilson & Sicart (2009, 2010)).

Disruption of 'Passive' and 'Active' Ludic Knowledge

The qualitative player study following the release of *Amnesia: A Machine for Pigs* identified a number of instances of specific disruptive game components being discussed by players. However, these instances can be broadly clustered together based on the way in which players are expected to apply the knowledge that the game is disrupting. Where the ludic knowledge being disrupted is directly linked to a player's ability to make progress in the game (e.g. it relates to a mechanic that enables the player to move, or to avoid enemies), this can be referred to as *active ludic knowledge*. This type of knowledge is a key factor in driving the player's moment-to-moment decision making. Where the ludic knowledge being disrupted is not directly linked to player progress (e.g. it relates to the game's story, characters, world, or lore), this can be referred to as *passive ludic knowledge*. This type of knowledge is important in providing broader game context and it may also provide additional motivation for players to continue playing in order to discover more of it. The player study demonstrated positive examples of disrupting both types of knowledge, leading to different forms of player cognitive engagement. Two examples are discussed in this section.

Disruption of passive ludic knowledge is demonstrated via the internal consistency of the structural rules of the game environments. The second half of the game contains two levels ('Tunnels' and 'Engine') in which the structural rules of the game environment are notably disrupted, with whole corridors appearing and disappearing dependent on player actions. By placing these disruptive scenarios late in the game, players have time to develop a seemingly reliable understanding of stable intraludic rules of the game world (i.e. that the world itself is static). The disruption of these established 'stable' rules requires the player to reconstruct new intraludic knowledge about how the game's environments work. The game's design intentionally only includes two instances of this disruption and does not draw any explicit in-game attention to the occurrences (e.g. the player's avatar does not acknowledge them), thus leaving the meaning and importance of the shifting environment ambiguous. The ambiguity provides a foundation for player cognitive engagement, allowing them to analyse, evaluate, and create their own interpretations of the game events. At the same time, the disruption does not prevent player progression (shifting corridors will never impede the player directly) and can be missed or ignored without detriment to the overall player experience. Player discussions focusing on this particular aspect of the game showed a number of positive experiences, for example:

> There were a few cool moments when objects or even doors and passages would appear/disappear leaving you a little confused or freaked out for a moment, but in a good way! (Forum Post Extract 1)
>
> I really like the reshaping of the levels and how it confused me (especially in [the level] where you have to look for the ingredients). (Forum Post Extract 2)
>
> One great thing *Amnesia: A Machine for Pigs* did, that as far as I've read is not mentioned at all in "big" magazines/sites review, is the fascinating subtlety of the changes in the game world (maybe because they are very easy to overlook). Pig mask [one of the small environmental props] appearing/changing, one mask that is visible when looking behind a painting but not when you are physically in the room, the owl statue that goes to the other side of the "hunting" room and more. This was really a high point of the game for me. (Forum Post Extract 3)

The selection of positive comments in response to these disruptive game components demonstrate that the intended effect of disrupting established intraludic knowledge to support heightened cognitive engagement was achieved for these players. In the above examples, two players specifically note the feeling of confusion as being a positive aspect of their play experience and this would have required a short-term increase in cognitive engagement in order to analyse the information the game was presenting to them and construct new understanding of it. This suggests that in instances such as this, it is possible to place players in a temporary state of confusion, typically associated with a failure in design, and for that temporary state to be an enjoyable experience.

Disruption of active ludic knowledge can be seen in relation to the player character's electric lantern. The lantern can be used to navigate the game's dark environments but also acts as an enemy proximity warning mechanism, flickering more or less intensely as enemies move closer or further away. This mechanic and the player's associated knowledge are directly linked to the player's ability to make purposeful, safe progress through the game.

The rules driving this flickering mechanic are not made explicit to the player and thus it is left to the player to identify the connection between the flickering lantern and the location of enemies. Initially, the connection is simply based on proximity. Later in the game, the rules are disrupted (again without notifying the player) to only make the lantern flicker when an enemy is within the player's view frustrum, regardless of proximity. Near the end of the game, a new enemy type is introduced that again disrupts the rules driving the flickering mechanic, now causing the lantern to flicker continuously and with random intensity as long as the enemy is spawned and active in the game environment. The rules driving this game system are thus not stable, while the reliability of the player's related knowledge is further kept in question throughout the game via the use of a number of scripted sequences in which the flickering lantern is triggered without the presence of a nearby enemy.

Each of these subtle rule disruptions, targeting the player's established intraludic knowledge, was designed to aid the player by implicitly suggesting the best approach to different game areas, thus rewarding player cognitive engagement. Early-game enemies simply need to be kept away from; mid-game enemies are found in large, open, dark areas where knowing enemy direction is more useful than just knowing enemy proximity; the final enemy in the game is best approached by simply running through the area it is found in as fast as possible, ignoring the lantern's warning mechanic completely. Players were thus to be rewarded for engaging with the game in a slower and more considered manner, analysing and evaluating the functioning of the lantern and creating new intraludic knowledge based on the changes in its behaviour. Where the previous disruptive game component (i.e. inconsistent environmental structure rules) did not impede player progression if it was not noticed, this component has a more direct impact on the player's ability to make progress. This component therefore had greater potential to have a detrimental effect on gameplay experience and in turn, critical player opinion. In the majority of cases, this did not seem to be the case, with numerous positive player comments identified. Many comments directly compared the lantern mechanic to a functionally similar audio mechanic in the first *Amnesia* game, *Amnesia: The Dark Descent* (Frictional Games, 2010) demonstrating application of existing interludic player knowledge:

> Do you not remember the monster spawning noises that gave you a warning [in *Amnesia: The Dark Descent]*? Personally, I find this flickering lantern a LOT scarier because you have no idea where they are except close. (Forum Post Extract 4)

> The monster chase music in *Amnesia: The Dark Descent* are a pretty obvious "ooooooooooooohhhhh there's a monster" clue so by omitting them they keep you on your toes. Also like that they have "random" music playing [. . .] to toy with our preconceptions. The lantern and lights flickering also function as a 'tell' but, again, they don't guarantee an encounter or anything. That's just there to mess with the player. (Forum Post Extract 5)

> My favourite feature is the fact that instead of spawning by sounding off loudly like [the enemies in *Amnesia: The Dark Descent*], the lights and lantern will instead flicker if they are nearby. (Forum Post Extract 6)

Other players focused specifically on the way the mechanic made them adapt their gameplay approach, demonstrating adaptation of intraludic knowledge:

> I liked how the game changed the rules, which is a good method for getting players out of their comfort zones. My whole strategy leading up to [the final enemy encounter] was to creep around in the dark, listening and [turning] the lantern on only when I needed to light up a section or find a pathway. It was enjoyable to find that method didn't really work against [the final enemy]. (Forum Post Extract 7)

While no players commented on the specifics of the changing rules of the flickering mechanic, there were numerous positive comments identifying the lack of stability in the mechanic and associated lack of reliability in its application as beneficial to the gameplay experience.

The environmental and enemy-agent-based disruptive game features discussed in this section demonstrate the positive game experiences that can be created through targeted disruption of a player's constructed intraludic knowledge during play. The flickering lantern mechanic also provides examples of players drawing positive comparisons based on their established interludic knowledge. Disruption of active ludic knowledge supports cognitive engagement by requiring in-game construction of new intraludic knowledge, such as new strategic or tactical approaches to scenarios involving enemy agents. However, disruption of passive ludic knowledge supports player cognitive engagement both during and after gameplay.

Disruption as a Catalyst for Extrinsic Reflective Cognitive Engagement

Disruption can be utilised by firstly allowing players to construct seemingly reliable knowledge of seemingly stable game systems before then making that knowledge inaccurate or unreliable. This is the approach exemplified in the two case studies in the previous section (in the 'Tunnels' and 'Engine' game levels). However, disruption can also be applied at the initial encoding stage, when in-game stimuli are encountered for the first time and initial knowledge is being constructed by the player. The most direct and explicit way to disrupt knowledge encoding is via the use of distractions, or through presenting players with multiple simultaneous stimuli. In both cases, players are less likely to be able to apply their finite attentional resources to a single stimulus for long enough to encode detailed knowledge related to it. However, such an approach also carries a risk of detracting from the impact of all of the competing stimuli without any notable benefit to the overall player experience.

A less direct, more implicit way of achieving this type of encoding disruption is through purposeful, selective provision of ambiguous or incomplete information to the player. This was discussed briefly in relation to the environmental discontinuity above, which was not explicitly explained to the player via the game. However, there were other disruptive game components implemented in *Amnesia: A Machine for Pigs* with the specific intention of making accurate, detailed intraludic knowledge construction impossible. None of these were directly linked to player progression (i.e. they disrupted passive ludic knowledge and could be missed or ignored without significant detriment to the player), instead forming elements of the game's narrative and the lore of the game world. One such disruptive game component was the use of a particular 'pig mask' prop placed semi-randomly in different locations throughout the game's environments (Figure 4).

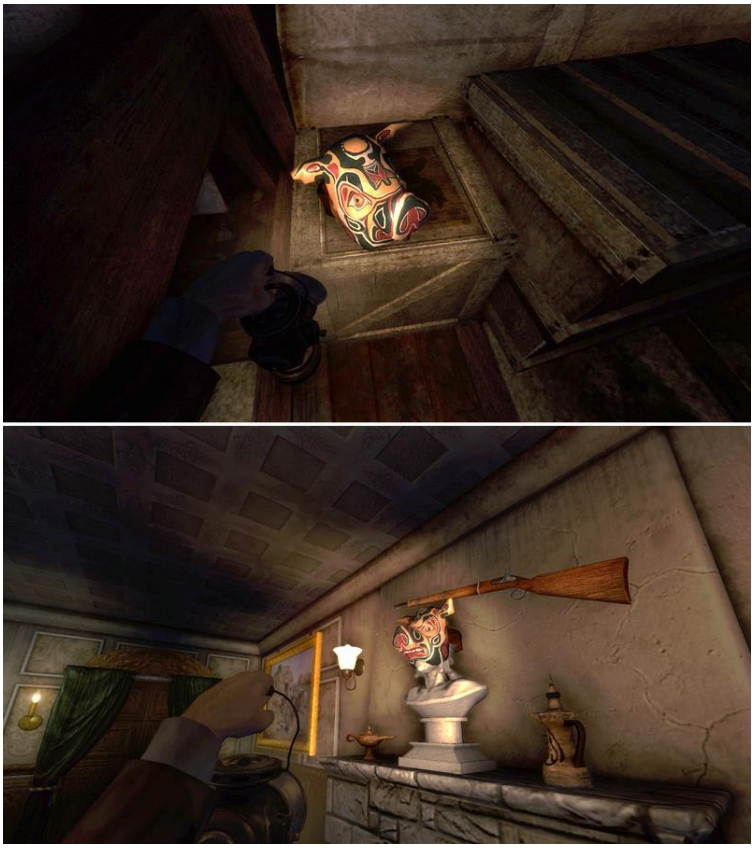

Figure 4: The 'pig mask' prop in two locations early in the game.

The pig mask prop is a recurring motif in the game, also present in the game's digital box art. It is frequently found in the game's early levels to increase the likelihood of the player noticing it and constructing initial intraludic knowledge of it. However, this intraludic knowledge is unlikely to have much meaningful context associated with it as the diegetic (i.e. in-game) purpose or meaning of the object is not explained. During the game's development, the development team considered a number of likely interpretations for the pig mask's meaning but there is no 'correct' interpretation that can be confirmed through diegetic information. It is impossible to construct definitive, accurate intraludic knowledge about the pig mask. This leads to a range of interpretations being formulated by players which provide insight into how other types of ludic knowledge are used to fill gaps in intraludic knowledge construction, as well as how disruption of passive ludic knowledge can lead to ongoing post-play cognitive engagement with game content.

In one instance, a player suggests that the masks "are like Aztec masks like people were talking about before the game came out (The Jaguar masks for sacrifice)", demonstrating an attempt to fill in intraludic knowledge using extraludic knowledge. In another case, a player suggests that the appearance of the pig masks throughout the game "was like a trail. Hansel and Greta [sic], breadcrumbs, etc." demonstrating further application of existing extraludic knowledge to support interpretation of intraludic game content. Other players preferred to interpret the meaning of the pig masks through the lens of the game systems, with suggestions such as "each time you notice a pig mask, it just appeared, and it means probably something changed in the level, or a door just closed". Such interpretation draws on the player's transludic knowledge of the rule-driven nature of game systems, with the pig masks being indicative or player progression, or of player interaction with certain triggers in the game environment. Lastly, other players interpret the masks within the meaningful context of the game's narrative, although using language that is possibly influenced by interludic knowledge drawn from *Amnesia: The Dark Descent*'s 'insanity mechanic'; for example, "they [the pig masks] appeared because we are insane I assume. That's all there is to it probably".

Disruptive game components that specifically disrupt the knowledge encoding process (e.g. by providing the player with incomplete or ambiguous information about game content or systems) provide insight into the role of ludic knowledge types in interpretation of game information and game experiences. They also provide a catalyst for cognitive engagement with the game even after gameplay has ended. This can be referred to as *extrinsic reflective cognitive engagement* and is similar to what has been previously discussed as 'reflective play' by Ang, Zaphiris, and Wilson (2010). This type of engagement with a game after gameplay has finished, or between game playing sessions, "is not just an action that resolves contradictions [between different player experiences] but also an activity that contributes directly to the fun and enjoyment of game play" (2010:372). Players that are motivated by incomplete intraludic knowledge following their experience of the *game as played* (i.e. the 'intrinsic' gameplay experience that takes place within the mind of the player) may seek further detail or 'closure' via discussion with other players, either online or in real life. This activity is extrinsic to the game itself whilst reflecting on the intrinsic experience. Disruption thus provides a mechanism for supporting cognitive engagement both during gameplay and for a period of time post-play, as players compare and contrast their game experiences and interpretations of game content.

Risks of Disrupting Player Expectations Constructed on Extraludic Knowledge

Alongside 'post-play reflection', the second concept outlined in the basic structure of ludic knowledge (Figure 1) is 'pre-play expectations'. Prior to playing a game, there are a range of extraludic stimuli, alongside existing transludic and interludic knowledge, which may combine to form an expected game experience in the mind of a player. This can be termed the player's *game as expected*. The qualitative player study of *Amnesia: A Machine for Pigs* identified a significant body of data suggesting an important link between the influence of extraludic knowledge on the *game as expected* and the 'weight' given to the properties of the *game as expected* when evaluating the *game as played* (i.e. the actual experience of playing the game). This section draws on a range of negative player comments to discuss identified risks of either, utilising disruption that intentionally targets player expectations based on certain extraludic knowledge sources or, unintentional disruption of particularly deeply rooted extraludic and transludic knowledge.

There were two components of *Amnesia: A Machine for Pigs* reported by players that had a significant impact on the player experiences of, and critical responses to, the *game as played*, despite not being components of the actual game software. Firstly, the game's 'genre' label assigned by various digital distribution platforms and media outlets; secondly the game's marketing material and in particular, its gameplay trailers. Both of these sources of information provided extraludic knowledge for players and a foundation for forming early expectations of the game experience. When players felt there was a mismatch in the alignment between the marketed game (i.e. their *game as expected*) and the actual game (i.e. their *game as played*), this resulted in a range of feedback with particularly strong negative feedback in many cases. This was particularly problematic when the expectations set by these extraludic knowledge sources were a distortion of the gameplay experience that the game would actually provide.

In the majority of cases, digital distribution platforms and media outlets labelled the game as a 'survival-horror' title. The game is more accurately described as a 'horror-adventure', however this label was only applied by a small number of outlets. The 'survival-horror' genre label provides a basis for players to recall other transludic knowledge based on the meaningful context that they construct around their individual understanding of that label. As Arsenault (2009:160) explains, genre is an imperfect tool for categorising games due to its "perpetually mutating" nature. While there is no industry-wide consensus on specific properties that particular genres of games should exhibit, genre labels are a frequently used descriptor on most distribution and media channels. Thus, such labels have an early impact on expectation formation and as shown in the case of *Amnesia: A Machine for Pigs*, this may follow through into negative critical opinion when a game does not align with players' personal criteria for what a particular genre of game should entail.

> I think most of the negative reviewers, myself included [. . .] feel disappointed at the lack of resemblance to *Amnesia: The Dark Descent* and the horror genre which we thought we were paying for. You have to admit the lack of adrenaline pumping action and palpable fear which is the main draw in the horror genre for instance. (Forum Post Extract 8)

> Not all horror is like *Amnesia: The Dark Descent* just like not all horror movies are like Nightmare on Elm Street. *Amnesia: The Dark Descent* and *Amnesia: A Machine for Pigs* are pretty much the equivalent of playing a horror movie. Those games fall under the same genre, which is horror, but utilize it differently. Just because it isn't what you expected or wanted doesn't mean it's something different, because it isn't. They all follow a similar idea of game play, which is putting you as the main character in a scary situation that you must figure out on your own. *Amnesia: The Dark Descent* was not purely survival horror and it isn't the best game that falls under that sub-genre either. (Forum Post Extract 9)

These two example extracts present the two main perspectives argued by players on the discussion forums. Both perspectives show evidence of drawing on established transludic and extraludic knowledge. Forum Post 8 shows evidence of a transludic association across horror games with a particular type of "adrenaline pumping", visceral, sensory-immersive experience. Forum Post 9 conversely demonstrates a transludic association across horror games with an experience requiring thought and "figuring [the situation] out on your own", representative of a more cognitively engaging experience. This extract also demonstrates use of wider extraludic knowledge of the horror genre in film to inform understanding of the *Amnesia: A Machine for Pigs* style of horror. In these two extracts which are representative of the split opinions of the wider player community discussion, it is evident that different player knowledge and how a game does or does not align with expectations can place limitations or freedoms on how those players are able to evaluate a game. By unintentionally disrupting player expectations based on this selection of deeply rooted extraludic and transludic knowledge, the game attracted negative critical attention that could otherwise potentially have been avoided.

Alongside the genre label applied to a game, the game's marketing material (e.g. trailers, screenshots, magazine advertisements, posters, etc.) is a primary source for constructing extraludic knowledge and pre-gameplay expectations. This can lead to negative critical and player responses if a game fails to live up to a perceived degree of quality or if advertised features are missing when the game is released. A recent example of this can be seen in the mixed responses to *No Man's Sky* (Hello Games, 2016), with the number of disappointed players requesting refunds leading to Valve having to place an explicit reminder of the Steam refund policy at the top of the game's digital storefront page (Kain, 2016). Games failing to fulfil the 'hype' that their marketing campaign generated is not a new phenomenon. However, the particular approach taken to the *Amnesia: A Machine for Pigs* marketing coupled with how players then responded to the game demonstrates that some forms of expectation disruption can have particularly detrimental effects on player opinion of gameplay experience (i.e. the *game as played*).

During development of *Amnesia: A Machine for Pigs*' two trailers were released, both of which contained live gameplay segments (Frictional Games, 2012a, 2012b). The purpose of both trailers was to provide the audience with examples of the type of gameplay and types of enemy encounters they could expect in the full game *without* spoiling actual sections of the final game. To this end, both of the sequences in the trailers did not feature in the final game, although the environments in which they were recorded were still present.

The intention was for players that had viewed those trailers to recognise the environments when they played the game themselves and to expect enemy encounters in both areas. The tension of expecting an encounter would be increased as the scenarios would not play out as they had done in the game's trailers.

Thus, via disruption of expectations based on the extraludic knowledge from the trailers, the aim was to provide players with a more 'horrifying' experience in these instances. However, analysis of the online player discussions found that on the contrary, a large proportion of the player community found the changes made between the trailers and the final game to be, at best, confusing and disappointing and at worst, to be evidence of false advertising and setting up false player expectations. The misalignment between these players' *game as expected* and *game as played* is reflected in a number of forum comments.

> Can anyone tell me where in the game this moment (00:33) was? [Referring to a timestamp in the first teaser trailer] Because I didn't experience it. Not to say that a moment from a year ago should or should not have been cut from the game, but that advertisement made the game appear to be in the same horror vein of avoidance, hiding, and survival as *Amnesia: The Dark Descent* which was the element I missed the most in *Amnesia: A Machine for Pigs*. (Forum Post Extract 10)

> The issue is not that the developer didn't include some prop or event sequence shown in the trailers. The trailers that were shown marketed tropes and motifs of the original *Amnesia* title, which the final product did not include at all. (Forum Post Extract 11)

> It seems a little shady on their end to remove scenes that portray the type of vibe that *Amnesia: The Dark Descent* had. It could be an example of a bait and switch [. . .] with the game having a completely different vibe than what those scenes [from the trailers] imply it feels as if they did it on purpose. (Forum Post Extract 12)

These players combined their existing interludic knowledge from *Amnesia: The Dark Descent* with the extraludic knowledge acquired from viewing the trailers to construct expectations of their experience of *Amnesia: A Machine for Pigs*. When the game experience failed to align with their expectations and failed to align with their memories of playing the first *Amnesia* title, the mismatch between the trailer content and the game content became a particular focus. Rather than disrupting expectation and removing predictability from those particular scenarios being viewed as a way of enhancing the game experience, it was viewed as indicative of a wider problem with the game not delivering what was marketed.

The problems encountered with *Amnesia: A Machine for Pigs*' marketing demonstrates the influence that extraludic knowledge can have on players and particularly, extraludic knowledge that in turn triggers recall of particular interludic or transludic knowledge. Once players have made a meaningful, contextual connection between knowledge of one game and knowledge of other games, comparison is inevitable. The *game as expected* is as important for developers and publishers as the *game as played*. Distorted expectations based on extraludic knowledge are not always rectified by the game's other qualities when it is released.

A Theoretical Framework of Ludic Knowledge

Following the completed design and development of *Amnesia: A Machine for Pigs* and the analysis of player discussion data, the full theoretical framework of ludic knowledge can be presented. This framework combines the previous work of Howell et al.'s (2014) ludic knowledge structure with the additional concepts of pre-play expectations and post-play reflection, as well as adding interludic knowledge as an additional ludic knowledge type.

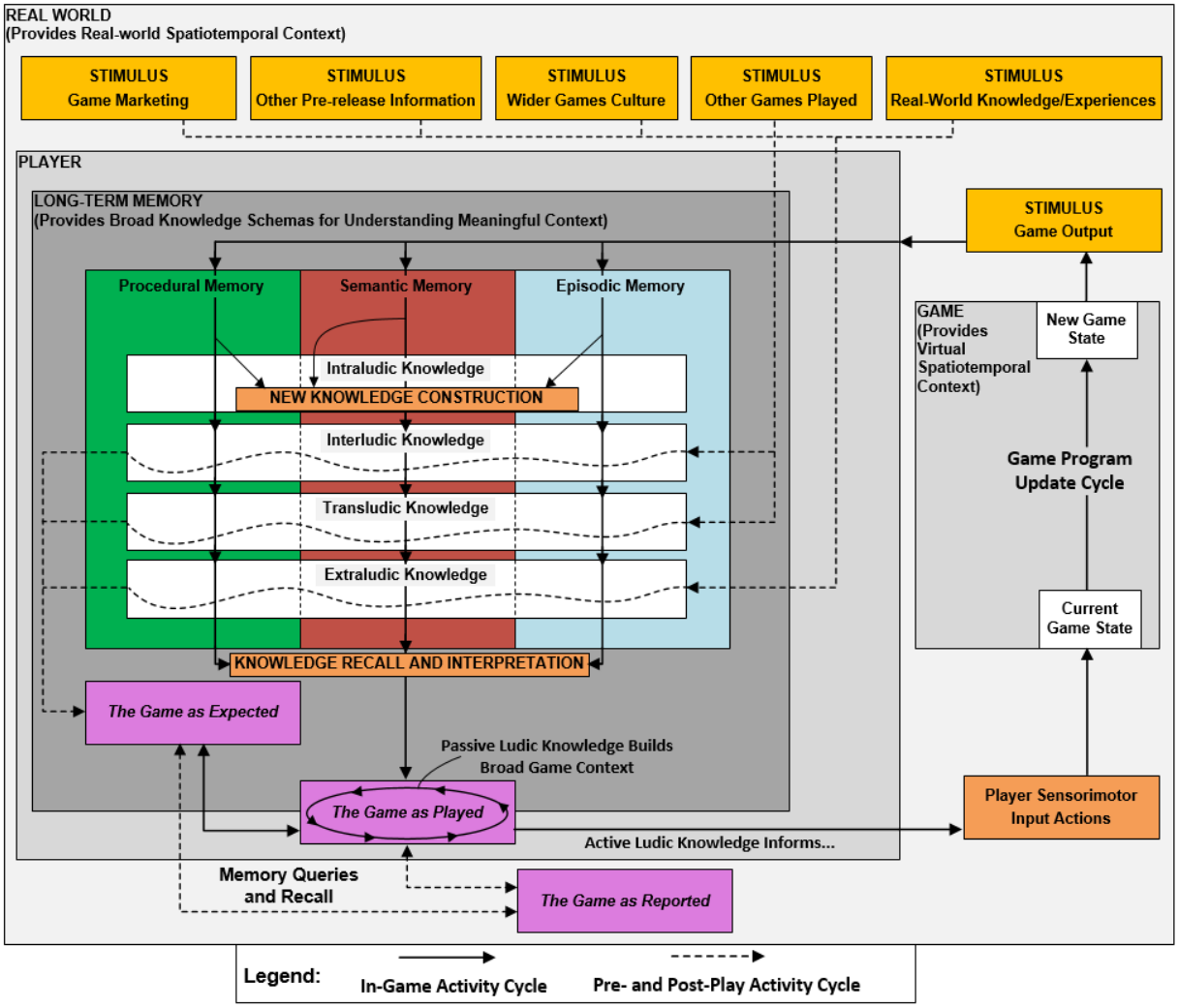

Figure 5: The theoretical framework of ludic knowledge.

The structure of the framework, containing the player's cognitive processes, specific sensorimotor input actions, and a game that updates its output each cycle, is based on the structure of Perron's (2006) heuristic circle of gameplay. The framework assumes a digital game and hence a program-based game update cycle, although a non-digital game could potentially be used instead with little effect on the rest of the framework. The framework also focuses specifically on the role of ludic knowledge in relation to expected and experienced gameplay and thus, does not include detailed functions of player cognition, such as perception, attention, and working memory (the schema-based model of player learning presented in Howell et al. (2014) provides greater detail in these areas).

The framework contains two separate but related cycles; the *in-game activity cycle* and the *pre- and post-play activity cycle*. Pre-play, there are a number of real-world stimuli that the player may engage with that will be incorporated into their extraludic knowledge. These include the game's marketing (e.g. *Amnesia: A Machine for Pigs*' trailers), other pre-release information (e.g. developer interviews, magazine articles, etc.), information drawn from the player's engagement with wider games culture (e.g. a personal understanding of what 'should' be in a game labelled as 'survival-horror'), and the player's collective life experience and non-game-based knowledge. Other games that the player has played in the past also provide interludic and transludic knowledge sources. All of these stimuli and the knowledge based on them allows the player to construct their *game as expected*.

During play, the game interaction cycle consists of, at a simplified level, player sensorimotor input actions, informed by active ludic knowledge, driving game updates which then provide output stimuli

for the player to interpret, based on the contents of their different ludic knowledge types. During play, new intraludic knowledge is also being created and updated in each cycle. The player's internalised game experience, or the *game as played*, may be influenced by recall of the contents of the *game as expected*. Players may feel positive or negative emotions during play dependent on the alignment between their expectations and the reality of play.

Post-play, players may choose to report on their game experience in some way (e.g. discussion with friends, posting on online forums, writing critical reviews, etc.). This can be termed the *game as reported*, and is based on a memory of the *game as played* and may also be further influenced by recall of the *game as expected*. Moreover, the longer the time between the experienced *game as played* and the *game as reported*, the greater the risk of introducing memory errors. Even if a player does not actively 'report' on their gameplay experience, the memory of the *game as played* will change over time. Memory *transience* is the process by which memory becomes less specific over time, shifting from "reproductive and specific recollections to reconstructive and more general descriptions" (Schacter, 2001:16). Memory of games played in the past become more general, containing less specific, accurate detail as the time since the memories were encoded increases. Thus, any expectations that players may construct related to *new* games based on distorted inaccurate memories of *older* games will be likewise distorted. This places limitations on what can be said to be 'known' about individual players' gameplay experiences as the *game as played* cannot be directly examined.

As discussed in greater depth by Howell (in press), analysis of gameplay experience data is always *second-order* analysis. Even a researcher reflecting on their own gameplay experience is still analysing a memory of gameplay, rather than gameplay itself. Data that is based on player memories of gameplay is likely to capture the particularly notable positive and negative aspects of the player experience while perhaps missing the less 'memorable', and therefore less discussed, aspects. There is a body of evidence to suggest that emotion and mood plays an important role in retaining long-term memories and that information encoded when highly emotionally aroused (either positive, or more often negative (Kensinger, 2007, 2009) emotion) may lead to better long-term memory of that information. Thus, the absence of a particular aspect of a game in player discussion should not be equated to that aspect having no impact on the *game as played*. It may simply not be memorable enough for players to self-select it as a point of discussion or feedback. Moreover, an imbalance of negative to positive player discussion may not always be a reliable reflection of the *game as played* as negative emotional memories may be more readily recallable than positive ones.

Conclusion and Directions for Further Research

This paper has presented a theoretical framework of ludic knowledge, demonstrated through its application describing disruption in the context of gameplay. The disruptive game components in *Amnesia: A Machine for Pigs* that have been described demonstrate different instances of effective disruption of different ludic knowledge types to support cognitive engagement. Analysis of particular game components in *Amnesia: A Machine for Pigs* alongside evidence from the qualitative player study carried out following the game's release has afforded identification of an additional ludic knowledge type (i.e. interludic knowledge), as well as a separation between *passive ludic knowledge* and *active ludic knowledge*, based on how the knowledge is linked to a player's ability to make meaningful progress in a game. The analysis has also provided evidence for detailing components of pre-play expectation of games (i.e. the *game as expected*), post-play reflection (i.e. *extrinsic reflective cognitive engagement* with the *game as played*), and the *game as reported*.

In *Amnesia: A Machine for Pigs*, the aim was to create a play experience that maintained enough interludic similarity to the previous *Amnesia* game to please fans of the series, whilst also supporting cognitive engagement via disruption of specific game components and in turn, disruption of intraludic, interludic, and transludic knowledge. The findings from the qualitative player study demonstrated the

impact that player expectation and different contextual awareness can have on the quality of a player's experience. These findings have implications not only for game design but also, for games marketing and player community engagement during the development of a game. Player knowledge and expectations formed from different sources many months or years before a game's release can directly affect post-play critical analysis and opinion. Indeed, the marketing of *Amnesia: A Machine for Pigs,* how it was categorised using common game genre labels, and how both of these factors influenced critical reception of the game, demonstrates some of the risks associated with disrupting certain elements of player expectation constructed on deeply rooted extraludic and transludic knowledge.

Further work will seek to test disruption through application to further commercial and non-commercial products to continue to develop understanding of how best to apply the technique to support cognitive engagement whilst minimising the risks of confusing or angering players. The theoretical framework of ludic knowledge does not need to be applied alongside the concept of disruption however and is intended as a standalone tool to be used as a basis for further critical analysis of how players engage with and talk about games. Schott (2016:122) for example refers to the ludic knowledge types and the concept of incremental accretive learning to his examination of violent games. It is hoped that similar further analytical work will continue to build on and further develop the framework presented here.

There is also scope for ongoing research that explores the spatiotemporal aspects of ludic knowledge and ludic context. Both individual player knowledge and a player's ability to interpret ludic context are dependent on a number of factors, such as the number and types of games played. Players from different sociocultural backgrounds may interpret game information differently. Similarly, older players that have been playing games for many years are likely to have a wider range of transludic knowledge to refer to than younger players. What may seem a new and innovative game mechanic to a younger player, may be readily interpreted through an older player's existing transludic knowledge. Ludic knowledge and ludic context will be modified over time as industry trends and conventions change. Indeed, the concept of disruption, if it was applied widely across many different games and platforms, may itself become a 'normative' design pattern. These aspects of place, time, and culture as they relate to ludic knowledge and understanding of ludic context provide interesting targets for ongoing research.

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