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Article Title: Using Reflexive Photography to Investigate Design Affordances for Creativity in Digital Entertainment Games

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Abstract

This article aims to provide an account of the use of reflexive photography in capturing player creativity in practice and present a guide to how game design can support player creativity. While previous literature has examined some aspects of player creativity in digital games, there remains a dearth of work which examines how design elements of games contribute to creative behaviour. Using a reflexive photography method with photo-elicitation interviews, this study identifies eight design affordances for player creativity in digital games and outlines the effectiveness of the reflexive photography method within the context of digital games. The identified design affordances related to the degree of flexibility of the game structure (e.g. open versus linear), narrative exploration, extent and diversity of game variables, opportunities for content creation, environmental interaction and exploration, avatar customisation, progression and replayability. Implications for the design of games that support creativity are discussed.

1. Introduction

Creativity has been widely investigated across domains such as education, the workplace and the creative arts and is said to provide a number of benefits such as positive psychological health (Richards, 2007), increased cognitive flexibility (Forgeard & Elstein, 2014), adaptive thinking (Kashdan & Rottenberg, 2010) and an increase in happiness (Silvia et al., 2014). Games are one medium which provides creative opportunities for those who play them (Blascovich & Bailenson, 2011; Ferguson & Olson, 2013). They can include ill-defined challenges which players can complete in numerous ways (Kiili, 2005; Voulgari et al., 2014), opportunities to create game content (Burri, 2011; Sotamaa, 2010) and emotionally challenging game narratives that can instigate reflection (Mekler et al., 2018; Whitby et al., 2019).

Although games may be an apt conduit for creativity, this phenomenon has largely been omitted from work regarding player experience, with studies which have granted focus on creativity usually only providing an account of one aspect of this multi-faceted construct. In particular, previous work has looked at discrete aspects of creativity such as social innovations (Ferguson, 2011; Wright et al., 2002), user-created content (Burri, 2011) and appropriating forms of play (Aarseth, 2007; Jarrett, 2014, 2016; Sotamaa, 2007). Problem-solving has also been considered, with work such as Iacovides et al. (2014) identifying a number of creative strategies players use to navigate

gameplay breakdowns. Other work has examined the ways in which games may prompt players reflect on, question and/or alter existing perceptions and views through emotionally challenging narrative and gameplay (e.g. Bopp et al., 2018; Mekler et al., 2018; Whitby et al., 2019).

Furthermore, the design elements of games which give rise to the different forms of creative expression remain largely under-investigated. Drawing from a previous study by Author A. (2020) which identified three unique expressions of player creativity in digital games along with six associated design considerations, this study aims to provide a fuller and more detailed account of the game design considerations which contribute to player creativity in practice. As such, this article aims to address the following research question:

What specific game design considerations contribute to player creativity?

By providing an account of how player creativity can be facilitated by various design considerations, this article aims to increase our understanding of creativity in this context and provide guidance to designers who want to build creativity into their games. By implementing the considerations outlined in this paper, designers can select aspects which support different expressions of player creativity. To answer the research question, in-depth and qualitative data is needed. Therefore, this article aims to provide evidence of the use of the reflexive photography method within the field of player experience as an appropriate research tool to investigate player experience of creativity, and hopes to pave the way for further studies to use this method within a digital gaming context.

1.1 Creativity

Creativity incorporates an amalgam of different processes, outcomes and traits. For example, creativity has been argued to comprise of a number of different cognitive processes (Finke et al., 1992) such as analogical transfer (e.g. Gentner, 1989), information synthesis (e.g. Thompson & Klatzky, 1978) and problem-solving (e.g. Treffinger, 1995). Creativity has also been viewed in terms of Big C creativity (e.g. Csikszentmilhalyi, 1996) relating to outputs of creative eminence and Little C or everyday creativity (e.g. Richards et al., 1988) relating to the smaller everyday accomplishments of normal individuals. To account for the levels of creativity in between Big and Little C, Kaufman and Beghetto (Kaufman & Beghetto, 2009) created the Four C Model of Creativity. In addition to Big and Little C, they identified Mini C which relates to personally meaningful interpretations and insights which can instigate changes in viewpoints and perspectives, and Pro C which refers to those who are professional creators but not yet reached eminent status. Finally, factors such as intrinsic motivation

(Amabile, 1990; Stohs, 1992) and risk taking (Craft et al., 2013; Csikszentmihalyi, 1996; Seddon, 2005) have been cited as playing a major role in the creative personality.

Digital games have been argued to be an apt medium to foster creativity by allowing players to engage in challenging situations free from external constraints and actively promoting experimentation with different solutions and approaches (Leng et al., 2010). Ill-structured challenges (i.e. challenges which can be solved in numerous ways) have been argued to be inherent in the majority of games, promoting creativity and fostering intrinsically motivating flow experiences (Kiili, 2005). Furthermore, studies by Moffat et al. (2017) found that gameplay contributes to a more creative state of mind, and Blanco-Herrera et al. (2019) identified a positive correlation between gameplay exposure and trait creativity scores.

Author A. (2020) classified the different forms of creative expression common in digital games into three main categories. The first category of "creativity as problem-solving" is synonymous with Little C creativity (Richards, 2007) and manifests as personally unique solutions to challenges and approaches to gameplay. This includes the experiential process whereby players are constantly testing and refining their strategies and ideas (Kiili, 2005), and the many methods which players devise to get around gaming breakdowns (e.g. where gameplay is disrupted) (Iacovides et al., 2014). The second category of "creativity as appropriation" involves the ways in which players can go above and beyond what is expected by developers, personalising the gameplay experience (Herodotou et al., 2012). This includes emergent (Jarrett, 2014) and transgressive (Aarseth, 2007) forms of play such as combining game variables in ways unforeseen by game developers or finding new goals within the game (other than those intended by developers) such as speedrunning. Appropriation also includes transformative play (Sotamaa, 2007) where players can create modifications and other user-created content (UCC) (Burri, 2011) within and around the game. Finally, the third category of "creativity as affective change" is aligned with the concept of Mini C creativity (Beghetto & Kaufman, 2007; Kaufman & Beghetto, 2009) and manifests as unique interpretations of gameplay and game narrative, including players' reflection and alterations of their perceptions and worldviews. Affective change is often instigated by emotional challenges (Bopp et al., 2018; Cole et al., 2015) which are presented through emotionally difficult themes (e.g. death, choices, fear), challenging choice-based dialogues and ambiguous storytelling. Emotional challenges can lead to reflection on gameplay and narrative and are most poignant when such challenges mirror those experienced by players in their own lives (Mekler et al., 2018).

In essence, there is growing evidence to suggest that digital games support creativity on a variety of levels, with several works focusing on specific aspects of player creativity such as

appropriation (e.g. Aarseth, 2007; Jarrett, 2014) and affective change (e.g. Bopp et al., 2018; Mekler et al., 2018). While studies such as Author A.'s (2020) provide a wider account of the different forms of creativity by players, questions remain around what particular affordances of digital entertainment games support the different forms of player creativity.

1.2 Affordances for Creativity in Digital Games

There have been numerous definitions of affordances – from Gibson's (1977) original concept of actional properties of an environment, to the broader definition of opportunities for action (Cardona-Rivera & Young, 2013), opportunities for a certain behaviour (Kim & Shute, 2015) or "environmental properties that create consequences for individual behaviour" (Alahuhta et al., 2014, p. 3). In the context of this article, a wider definition of affordances will be used; namely one that views affordances as opportunities provided by the game for creative actions, behaviours or thoughts.

Affordances have been argued to play a key role in creative behaviour, where creativity is enhanced through interaction with the environment (Amabile, 1996). Glăveanu (2013) argues that affordances can either constrain or allow creative actions, with creative individuals able to exploit affordances in innovative ways which allow them to not only to discover new affordances, but also creative affordances to achieve certain actions. Similarly, Withagen and van der Kamp (2018) argue that creative individuals are also able to use existing affordances in unconventional ways. In this way, affordances do not relate to one specific action or behaviour but can realise multiple uses from the conventional to the highly creative (Glăveanu, 2013).

In his ecological approach to gameplay, Linderoth (2013) argues progression through a game is facilitated by exploratory and performatory affordances. The former provide knowledge about available affordances (e.g. identifying items by colour) and the latter realise these affordances (e.g. using these items in the creation of potions). In this way, the player associates certain objects with their in-game function. However, the role of player cognition is largely neglected – for example some cognitive processes must occur such as understanding the mechanics of the game and comprehending and following the game narrative. In order to take into account cognitive processes, Cardona-Rivera and Young (2013) proposed a cognitive theory of affordances for games which takes into account other factors such as personal experience and gaming history. Cardona-River and Young (2013) identified three types of affordances common in games: "real affordances" (relating to affordances for actual game actions), "perceived affordances" (affordances relating to what a player perceives as possible) and feedback affordances (relating to the perceptual information targeted at

promoting real affordances). Wider factors such as player experience, history and personal beliefs play a crucial role in how players perceive affordances – for example, those who have played certain genres of games before will be able to identify more perceived affordances in similar games than those who have no previous experience with that genre of games.

While theories such as Linderoth's (2013) and Cardona-Rivera and Young's (2013) provide an overview of the main types of affordances in games, they do little in the way of linking affordances to player creativity. In relation to how games can be designed to support player creativity, there remains a limited amount of literature. Unlike traditional media, digital games afford players a high level of interactivity where they can customise and manipulate elements such as content, storyline and meaning (Grodal, 2000; Weber et al., 2014). Järvinen's (2008) concept of the possibility space could be used to illustrate how games can support player creativity through starting in a well-defined state (e.g. a fairly linear path) before branching out and allowing the player to reach the end of that path in a multitude of ways, such as through different routes or using different tactics. Essentially, the larger the possibility space, the greater the scope for player creativity and imagination (Järvinen, 2008). On a similar note, Aarseth (2012) differentiates between ludic space and extra-ludic space, where the former relates to the area which is playable and the latter relates to the surrounding non-explorable space. Different types of games have differing levels of ludic and extra-ludic space – for example, an open-world game such as *The Elder Scrolls: Skyrim* (Bethesda Game Studios, 2011) contain a large ludic space explorable to the player, whereas the narrative driven game of *Life is Strange* (DONTNOD Entertainment, 2015) contains a smaller ludic area.

Another aspect of games which offer players opportunities in terms of creativity is narrative. Narrative has been argued to play a major role in player experience (Cole et al., 2015), with many games now providing opportunities for narrative exploration through diverging storylines and choice driven dialogues. Young and Cardona-Rivera (2011) argue that a narrative affordance constitutes a course of action when a player can envisage the action in relation to the game's narrative. In this way, affordances in game narrative may play an important part in affective change where players can reflect on the outcomes of their actions in relation to the story.

Creativity can also manifest in terms of a player's "alterbiography" (Calleja, 2011) which constitutes the personal narrative they create as they play the game, as opposed to the scripted narrative of the game. Affordances for avatar customisation play an important part in how players construct their personal narrative, especially when a game supports altering the look of their character at any given time (Behr et al., 2016; Ward, 2015). Further opportunities for players to be creative are evident in terms of customisation and co-creation of game content. According to Behr

et al. (2016) there exists a customisation/co-creation continuum "ranging from simple in-game options to complex modification scenarios" (Behr et al., 2016, p. 289).

In short, affordances have been suggested to play a crucial part in creative behaviour (Glăveanu, 2013; Withagen & van der Kamp, 2018). However, while work exists which suggests that there are game design elements which support player creativity, there remains a grey area as to what forms of player creativity these design elements may support. This study aims to shed light on this issue.

2. Methodology

2.1 Reflexive Photography in the Context of Digital Games

Reflexive photography alongside photo-elicitation interviews were chosen to provide a means of capturing creativity in practice within digital games and to illuminate the particular aspects of games which facilitated or constrained creative behaviour. While reflexive photography has not been used as an approach to investigate gaming experiences to the author's knowledge, the method has been used to examine participant experiences in other fields such as education and sociology. Originally derived from the critical pedagogy work of Paulo Freire who used "coded situations" (e.g. sketches or images) to act as a stimulus for a group or individuals to critically analyse their own situation (Shulze, 2007), reflexive photography is grounded in individual-environmental interaction theories and symbolic interactionism – mainly that behaviour is a result of the interaction between individuals and their environment and the particular meanings that individuals ascribe to things. It has been claimed that creating photographs promotes participants to think more thoroughly about the issues under study (Wallace, 2015). For example, studies by Douglas (1998) and Hill (2014) reported that participants spent more time thinking about the meaning of the images they captured, how best to capture their ideas and what images they wanted to share with the researcher.

In photo-elicitation interviews, the photographs serve as the central point of focus, with the interviewee interpreting the images retrospectively (Harper, 1994). One way of achieving this is through autodriving, where the interview is "driven" by participants' reflection of their own behaviour (Heisley & Levy, 1991). Using photographs in this way can illuminate participants' experiences, attitudes and perceptions and can "carry or evoke three things – information, affect and reflection"(Rose, 2007, p. 238).

In previous studies which used reflexive photography (e.g. Schulze, 2007; Wallace, 2015), participants have been provided with cameras or have made use of their own smartphones to take

pictures over the course of one or two weeks. In the context of this study, participants took screenshots of a gaming instance which invoked them to think creatively or led them to undertake creative action – and conversely, in instances where they felt their creativity was being restricted or inhibited. Using screenshots instead of digital photographs allowed participants to stay involved in the game with minimal disruption. This aimed to explicate the role of in-game environmental and social factors which may contribute to creativity. Additionally, it also provided a view into the subjective interpretations that individuals ascribe to scenarios which they feel induce elements of creativity. In line with previous reflexive photography studies, participants took their screenshots over a one-week period, before taking part individually in photo-elicitation interviews the following week. Participants were asked to select three screenshots for discussion in the interview. While the interview focused on the screenshots captured, a set of five questions was used to loosely guide the discussion. An additional two feedback questions were asked at the end of the interview. See Table 1 for a list of the interview prompts.

Table 1: Photo-Elicitation Interview Protocol

Photo Elicitation Questions (repeated for each of participant's screenshots)	
Question No.	**Question Text**
Q1	Can you tell me what was going on in the game when you took this screenshot?
Q2	What were you hoping the screenshot would capture?
Q3	How would you describe the creativity involved in this screenshot?
Q4	What aspects of the game enabled you to behave in this way/do X or Y?
Q5	Had you ever had similar gaming experiences or was this a one off? a. Do you feel these/this type(s) of game(s) allow for greater/lesser creativity?
Concluding Questions (only asked once at the end of the interview)	
Question No.	**Question Text**
Q6	Is there anything else you would like to add?
Q7	Do you have any comments or feedback on the methodology used? a. Do you feel the reflexive photography method worked well in capturing instances of creativity during gaming?

2.2 Participants and Recruitment

A total of nine participants (6 male, 2 female, 1 non-binary) took part in the study. Ages ranged from 22 to 38 (median: 32). Participants played a range of online and offline games, with genres including role-playing, puzzle, action/adventure and sport. Participants played between 4 and 7 days a week (median: 5) across a variety of gaming medium including PC, console, handheld and mobile. Participants were asked what type of gamer they identified as, with 2 identifying as hardcore gamers, 6 as moderate gamers and 1 as a casual gamer.

Participants were recruited via a wider recruitment study advertised on popular gaming forums, social media and gaming mailing lists. As the study aimed to attract a wide variety of participants who did and did not self-identify as creative, no definition of creativity was provided so participants captured instances which they personally defined as creative and ensure results were not biased in favour of a particular conceptualization. Participants were sent an information leaflet detailing the nature of the study (i.e. how digital games may support player creativity), what was required of them (i.e. to take screenshots during their regular gaming sessions), and how the interviews would be structured (i.e. questions based on their screenshots). In addition, they were sent a short guide on how to take screenshots on various popular gaming platforms.

Participants were able to select a week which was convenient to them to carry out the reflexive photography task and a day during the following week to take part in the interview. They were then sent a template to copy and paste their screenshot into and add a caption and comments if they wished. To maintain as natural a setting as possible, it was stressed that participants were not required to play games any more or less frequently than what they would normally play, and that screenshots should be taken during their normal gaming activity. At the end of the reflexive photography task, participants were asked to select three screenshots to discuss and email these to the principal researcher prior to the interview. No information was recorded on the original total number of screenshots participants took prior to this. All participants sent three completed screenshot templates, with the exception being one participant who emailed eight completed screenshot templates with captions and comments, and after discussion with the principal researcher, selected three for his interview. While the additional screenshots were not discussed in the interview, they were included as illustrative examples of themes. Interviews were conducted over Skype and lasted between 29 minutes and 1 hour and 13 minutes, with the mean interview lasting 50 minutes.

2.3 Data Analysis

Data analysis was carried out using Nvivo 11, where a hybrid thematic approach was adopted involving both inductive and deductive iterations (Swain, 2018). This approach was selected as the research question was produced from the findings of a previous study and hence, some data already existed in the form of pre-existing themes. As such, in the deductive iteration, data were analysed using the six pre-existing themes of design considerations in digital games identified by Author A. (2020). These included the themes of *freedom of play, environment, replayability, tools, avatar* and *creation.* The application of these themes allowed an initial categorisation of the data

and provided a starting point for further refinement. As such, in the inductive iteration, the existing themes were refined further into sub-themes, new themes were identified. Screenshots were used to illustrate each theme; however, these were not mutually exclusive, i.e. one screenshot may include several design affordances and hence represent more than one theme. A total of 32 screenshots were included. A breakdown of screenshots by game genre is shown in table 2.

Game Genre	Number of Screenshots
MMORPG	8
Role Playing Game (RPG)	7
Puzzle	5
Online Battle Royale	3
Simulation	3
First-Person Shooter (FPS)	2
Action/Adventure	2
Sport	2

Table 2: Breakdown of Screenshots x Game Genre

After the initial development of the themes by the principal researcher, a transcript was sent to three colleagues to code interpedently. This aided in investigator triangulation by ensuring there was researcher consensus and that the themes accurately captured the specified concepts (Blandford, 2013; Twining et al., 2017). This resulted in renaming the themes of *freedom of play* and *creation* to *degree of flexibility* and *content creation* respectively. See Table 3 for a breakdown of the design affordance themes, including the two new themes of *narrative* and *progression*.

Design Affordance Themes		
Main theme	**Sub-themes**	**Descriptor**
Degree of Flexibility (formerly Freedom of Play)	Player Trajectories Linear Task Flexibility	Creativity related to the overall game structure (e.g. open versus linear games) and scope for alternative routes of play.
Narrative (new theme)	Story Choices Personal Narrative	Creative engagement with the game's narrative – either directly within the game such as exploring dialogue choices, and around the game in terms of affective elements and the use of narrative aspects in the creation of personal narratives.
Tools	Items & Abilities Movement	Game variables usually directly related to gameplay progression such as items, abilities and movements.
Content Creation	Objects, Levels & Maps	Creation of game content such as objects,

(formerly Creation)	Interface Mods	levels and images (usually aesthetic and not directly related to game progression). Additionally, options for playing with mods and importing own media.
Environment	Exploration & Interaction Aesthetics & Sound AI	Environmental aspects such as graphical realism, opportunities for environmental interaction, opportunities for exploration, synchronisation of sound, environment and player actions and realism of AI behaviour.
Avatar	Appearance Emotes & Voice	Avatar appearance and customisation of emotes and voice.
Progression (new theme)	Challenges Paid Features & Unlockables	Progression in the game such as challenge versus skill balance, pay-to-win features versus pay-to-look good features, hints at appropriate times and variety of achievements to contribute to sense of progression.
Replayability	Updates Developer Events	Opportunities for refreshing the gameplay experience such as downloadable content which adds to the existing narrative, patches and updates which remedy imbalance issues, and creative events instigated by the developers.

Table 3: Design Affordances Theme Overview

3. Findings

3.1 Degree of Flexibility

Degree of flexibility encompassed affordances in relation to autonomy over the play trajectory (i.e. different routes through the game, sidequests, different playstyles, etc). Some examples included open-world games which allowed players to create their own path through the game and define their route of play. This could be achieved through means such as altering a playable character's abilities and statistics to enable different play styles (e.g. stealth, magic based, etc). An example was cited by one participant in relation to *Fallout: New Vegas* (Obsidian, 2010):

> *"The way you assign your points, gives you, lends well to different playstyles, so for example if you want to be really sneaky, or if you prefer using guns or explosives and that sort of thing. So obviously I find that to be a particularly good creative outlet in the sense that you're not limited to one way of playing. You're free to play in any way you like, including really weird combinations."* – Male, 28

Other references included games which supported task flexibility. In such games, players could complete challenges in different ways such as creating multiple strategies or, as one participant illustrated in her screenshot (Figure 1) of *The Witcher 3: Wild Hunt* (CD Projekt Red, 2015), finding new locations to complete achievements:

Figure 1: Slide Achievement in The Witcher 3: Wild Hunt

While many references in *degree of flexibility* were in relation to open-world and sandbox style games, players also discussed how creativity could be constrained through a more linear game structure. However, while some suggested linear games afforded fewer opportunities to be creative, these games were still seen as being creative from a design and development standpoint.

3.2 Narrative

While *degree of flexibility* related to how the overall structure of the game provided opportunities for creative gameplay and discovery, *narrative* encompassed opportunities for creative engagement with the game's narrative. This included how the game story and characters could prompt emotional engagement, reflection and further exploration of challenging issues. In her screenshot of *Final Fantasy XV* (Square Enix, 2018), one participant explains how a particular scene made her consider the effects games can have on people, and how she further explored such themes (Figure 2):

Figure 2: Noctis Lucis Caelum (Final Fantasy XV: Royal Edition, PC Version)

While the majority of references in *narrative* were to games with strong narratives, other examples were also discussed. ted. This included MMORPGs and non-narrated games where the story was uncovered largely through gameplay and players were able to create their own personal narrative. Games such as *The Elder Scrolls V: Skyrim* (Bethesda, 2011) provided more "creative room" as there was no voiced protagonist so the player needed to "bring" more to the story (male, 30).

Other ways in which players could be creative in terms of *narrative* involved choice-based dialogues where the player is afforded opportunities to make decisions that affect the key components of the narrative. As one participant referenced in relation to *The Witcher 3: Wild Hunt* (CD Projekt Red, 2015):

> *"The game asks you to pick from their choices and then sometimes depending on the order you do interactions or the steps you take to get there it'll unlock new ones and it rewards you for that sort of creativity…the game already has a certain amount of encouragement in making you make your own decisions and how you want the story to play out."* – Female, 36

Such games allowed players to make "meaningful choices" (male, 30) and provided opportunities for narrative exploration through diverging storylines and choice-based scenarios.

3.3 Tools

Tools related to the variety of items, abilities and range of movement afforded to players. This often served as a pre-cursor for task flexibility as a wide range of *tools* allowed situations and challenges to be completed in different ways. An example included games where players could creatively combine different game variables such as *The Darkness II* (Digital Extremes, 2012)Moreover, the player's attention was drawn to useable objects which were "highlighted in purple" (male, 35) and afforded numerous different actions such as throwing, impaling and shielding. Other examples included games such as *Ring of Elysium* (Tencent Games, 2018) where players could utilise different forms of movement to explore the world which provides "the travel ability or the extremes which I can't try in real life [but] I can do in the game" (male, 32).

Figure 3: Gliding in Ring of Elysium

By providing alternative modes of transport such as glider (Figure 3), as well as extended ranges of movement including swimming, players are able to explore the game world in a range of ways. While the variety of different items, abilities and movements were cited as being facilitators for creativity, the rate at which they were introduced into the game was also important in sustaining player motivation. As one participant mentioned in relation to the puzzle game *Thomas Was Alone* (Bithell Games, 2012)*:*

> *"So you're trying to navigate these levels and as more and more of these characters are introduced, you need to combine them, make them, like you know, like in this case stack top of each other. And they interact in all sorts of other ways based on their abilities…When you start with these tools and these obstacles and [they] just like ramp it up a little bit, give you a new ability, give you new ability, give you new ability."* – Male, 35

In this way, gameplay is constantly kept fresh, with the player being given new tools to creatively combine and experiment with. Finally, tools were seen as particularly important only when they had effect on gameplay. This was illustrated by one participant's screenshot of *Alien: Isolation* (Creative Assembly, 2014): "you have all these tools, but very few of them actually work on the most dangerous thing in the game" (male, 35). Thus, it may be a combination of the variety of tools and their effectiveness that is key to facilitating creative behaviour (e.g. you can have a large amount of "gimmick" (male, 35) tools but none of them actually matter in terms of progressing in the game).

3.4 Environment

In *environment* references related to exploration and discovery of the game environment, particularly in relation to open-world games which did not restrict the player to a pre-determined path. Several participants cited freedom to explore as being one of the most creative aspects, especially when developers implemented hidden objects to be discovered. As one participant describes in relation to *Ring of Elysium* (Tencent Games, 2018): "for me it was the creativity…to find more aspects of the game, more things hidden in the game" (male, 31). Another participant captured *Xenoblade Chronicles 2* (Monolith Soft, 2017), which has an open-world design with "so many secrets, and there's so many places to go and discover" (female, 31).

While exploration was important to players, interaction with the environment and different objects was also cited as being a facilitator of creativity. For example, one participant referenced *The Darkness II* (Digital Extremes, 2012) highlighting how a light/dark mechanic dictated which abilities could be used, and which abilities were used by enemies. To combat this, the game allows the player some control over light and dark by being able to shoot light sources and the generators which power them. While such a mechanic makes the game more challenging, it also forces the player to be more strategic in their actions. Realistic artificial intelligence (AI) of enemies also supported player creativity, with more sophisticated AI behaviour prompting players to play more strategically and "more cautiously [and] sometimes take risks" (male, 25).

Finally, the aesthetics of a game were cited as being a facilitator for creative inspiration. This was illustrated by one participant who set up her screenshot to capture what she later wished to use as inspiration in a story she was writing (Figure 4).

Figure 4: Creative Inspiration from Red Dead Redemption 2

In this way, creativity is facilitated both within the game in terms of setting up the scene for the screenshot, and outside the game, in terms of providing inspiration for further creative behaviour.

3.5 Content Creation

Content creation referenced instances where players could create in-game objects, levels and maps, in addition to customising the game interface and implementing modifications. In relation to the creation of game objects, levels and maps, sandbox games such as *Minecraft* (Mojang, 2011), *Little Big Planet* (Media Molecule, 2008) and *Animal Crossing: Pocket Camp* (Nintendo & NDcube, 2017) were the most commonly cited genre. In such games, "having the sandbox environment to create levels is probably where your creativity is endless" (male, 38), with games which allowed the player

to import their own media into the game providing further opportunities for creativity. As one participant illustrated in his screenshot of *Little Big Planet* (Media Molecule, 2008) (figure 5):

Figure 5: Customising "Sackboy" in Little Big Planet 3

Even games which did not allow players to import user created content such as *Animal Crossing: Pocket Camp* (Nintendo & NDcube, 2017) could still provide scope for creativity in terms of placement and customisation of objects. However, the objects created or used as decoration within the game still needed to be able to fulfil their functional uses. As was cited by one participant in relation to *Stardew Valley* (ConcernedApe, 2016)*:*

> *"It's like, I've got a sofa but I can't sit on it…and so it's like I tried and then just thought, well, if it doesn't really add anything and I don't really, it's not something I really enjoy then why keep doing it."* – Non-binary, 35

In this way, while the player's house could be decorated with a variety of different objects, very few of these were interactable. In contrast, games such as *Animal Crossing* (Nintendo, 2001)*,* include "stuff you can interact with, or you can sit on a chair or lie down on a bed" (non-binary, 35). By providing a more realistic experience (i.e. objects had use value as they would in real life), the player is able to design houses with the use value of objects in mind.

A variety of interface options was also important in providing opportunities for players to be creative, as evident in games which included specific screenshot modes such as *Fallout 76*'s (Bethesda Game Studios, 2018) "Photomode" (male, 22) and *Final Fantasy XV's* (Square Enix, 2018) *"*Camera Mode" (female, 31). Such modes allowed players to set up their shots, taking into account compositional elements such as light and filters.

3.6 Avatar

While customisation of game content such as objects, levels and maps provided creative opportunities to players, customisation of the playable character or avatar was also important. This was largely highlighted in affordances for appearance alteration such as clothes, hairstyles, physical features and different types of voices which allowed players to "portray character[s] in really different ways, and sometimes really weird ways" (male, 28). Players also appreciated games where they could alter their avatar's appearance at any given moment. One participant, in reference to *Fallout 76* (Bethesda Game Studios, 2018)*,* noted that he could "add more scars and damage to my

character to signify the time I went through" (male, 22). This feature facilitated not only creativity in terms of avatar appearance but also enabled the player to evolve his character in accordance with his own personal narrative.

Opportunities for avatar customisation were cited as an important outlet for personal expression, especially in MMORPGs where there can be thousands of players online. As one participant illustrated in his screenshot of *Final Fantasy XIV* (Square Enix, 2010) (Figure 6):

Figure 6: Character Creation in Final Fantasy XIV

Avatar customisation was achieved in many games through the use of "sliders" (e.g. graduated scales for increasing/decreasing facial features) and cascading options (e.g. one customisation option led to several others for finer details). However, as the participant above noted in relation to *Final Fantasy XIV* (Square Enix, 2010) there were certain "rules in place" (male, 30) which related to some aspects of customisation which were limited such as body shape and age.

3.7 Progression

While *progression* was identified as a theme, it was not directly linked to opportunities for creativity, but instead related to aspects which maintained player motivation for being creative. The most common aspect of progression was balanced challenges in line with the development of player skills. This included games such as *Oxygen Not Included* (Klei Entertainment, 2017) which started off with simple tasks before expanding and moving on to "more complicated stuff" (male, 22). Other examples included games which provided hints at appropriate times and during instances where the route of progression is not obvious to the player as was cited by one participant in relation to the game *Thomas Was Alone* (Bithell Games, 2012). In the game the player has to navigate through levels using a variety of different shapes, each with their own unique ability:

> "*one of them [shapes] floats in water and it tells you because I don't think you would put it in water because the other blocks drown…But they don't tell you any of the combinations [of shapes]*" (Male, 35).

Further examples of challenges included the achievements which many games include. These provide additional optional challenges which players and complete outside of the main story/mission.

Other references in the progression theme included instances related to paid features and unlockables. Games which incorporated "pay to win" elements or loot boxes which directly affected

gameplay were cited as being demotivators for play. For example, one participant took a screenshot of *Pokemon Shuffle* (Genius Sonority, 2015) on the Nintendo 3DS (Figure 7) where they had spent significant amount of time playing the game and then "hit a brick wall" (non-binary, 35) where the only way to progress was to purchase items using real money.

Figure 4: Pokemon Shuffle on 3DS

In this way, while they "really wanted to solve this problem [and] work through this puzzle" (non-binary, 35) they were prevented by needing to purchase in-game money to buy an item needed to progress. In instances such as this, the player's skill is no longer the key to overcoming such challenges, hindering motivation and subsequently inhibiting the creativity which could have been used to overcome the challenge.

3.8 Replayability

Replayability related to ways in which the gaming experience was renewed through updates, patches, expansions and developer events. While such aspects may not be considered affordances in the traditional sense, they provided opportunities for players to be creative and engage in the game development community. Examples included games which were expanded through downloadable content (DLCs) and was evident in both offline and online games. For example one participant detailed that the DLCs for *Final Fantasy XV* (Square Enix, 2018) which implemented new adventures that provided further scope for narrative exploration and material for her to use in her own creative hobbies outside of the game. Other examples related to the online game *Final Fantasy XIV* (Square Enix, 2010) where developers were listening more to what players wanted and releasing expansions and updates to address player concerns such as "imbalance problems" (male, 30) and crowded servers.

Other ways in which replayability could be increased through providing opportunities for creativity included developer events and competitions such as house building competitions, photography competitions and races to find hidden objects. Such events hosted by developers helped refresh the gaming experience through providing additional challenges and activities. As one participant detailed in relation to *Ring of Elysium* (Tencent Games, 2018):

> *"Ring of Elysium have their own Twitter…and they're running challenges like let's find something on this map. Like always they are putting something, some hidden gems there…and they are asking the community just find something in the map [that] we hid in there. We are not going to give you clues what is it; just go there and have adventure and make a picture from the game and show it on the Twitter."* – Male, 32

Players are encouraged to document their finds and showcase these on the official developer

Twitter page for other members of the gaming community to see. Other examples of this included *Final Fantasy XIV* (Square Enix, 2010) where developers ran competitions for object design and player artwork. These events not only provide additional motivation for playing the game, but also facilitate creativity by allowing the gaming community to play a part in the development of the game.

4. Discussion

The aim of this article was to provide an account of the use of reflexive photography in capturing player creativity in practice and to present a guide to how game design can support player creativity. The reflexive photographic method allowed participants to take screenshots of what they felt was important in their gaming experience, providing participants with autonomy of choice and individualising their research contributions. In this way, the participatory nature of the research became an act of creativity in itself for participants, with several noting that the reflexive photography task instigated them to become more aware of their creative gaming endeavours. The screenshots facilitated rich descriptions and reflections by the participants, in addition to providing pictorial references for the themes identified. By having the photo-elicitation interviews structured around the participant's selected screenshots, the interview was highly focused on these snapshots of creativity in practice and allowed the research question to be addressed directly.

In relation to how player creativity could be supported in games, the overall consensus was that there were many aspects of entertainment games which supported a variety of creative forms. *Degree of flexibility* encompassed opportunities for different player trajectories and task flexibility. Tailoring of the gaming experience was usually achieved through real affordances for alteration of character statistics (e.g. altering different attributes through adding/removing points) which dictated the perceived affordances (Cardona-Rivera & Young, 2013) for different playstyles (e.g. more points on agility resulted in more stealth type abilities being available). The flexibility of the play trajectory supported appropriation as players have the control to personalise their gaming experience (Herodotou, 2009). The greater the ludic space (Aarseth, 2012), such as in open-world games, the more opportunities there were for task flexibility. In this regard, *degree of flexibility* presented opportunities for creativity as problem-solving such as devising strategies and tackling challenges in multiple ways. Furthermore, a larger possibility space (Järvinen, 2008) does appear to support creativity in terms of appropriation whereby players can find new routes to progress through the game - sometimes being unforeseen by developers.

Games with a linear structure were usually more constricting of player creativity in this regard due to the possibility space being limited through lack of choices and actions (Järvinen, 2008). Linear games needed to have a genuine possibility space, and not give the semblance of having a larger possibility space – or in other words, the perceived affordances of the player needed to match up to the real affordances the game offered (Cardona-Rivera & Young, 2013). It was also pointed out that, while not affording the same amount of creativity to players, linear games were still creative for those involved in the development and design process (Bogost, 2011; Clarke & Mitchell, 2007; Smithsonian Institute, 2012).

Affordances in *narrative* supported creativity as affective change through structured narration (e.g. a story with a narrated protagonist) which often presented players with emotional challenges (Bopp et al., 2018; Mekler et al., 2018) involving difficult themes or choices. As several participants detailed, this could lead to further creative behaviour outside of the game, and as a potential means for reflection on gameplay and wider narrative themes. This also lends support to previous studies which have found gaming can facilitate reflection (Mekler et al., 2018; Whitby et al., 2019). However, it is worth noting here that previous studies found few instances of deeper levels of reflection, and while participants in this study did mention that games instigated reflection this was not the main focus of the study.

Creativity as affective change could also be supported by encouraging narrative exploration of dialogue options (e.g. the mechanic of selecting a choice). In this way, choices realise narrative affordances by encouraging players to envisage various outcomes of the story (Young & Cardona-Rivera, 2011). In relation to games with open narratives such as MMORPG's where the narrative could be ambiguous (e.g. players have to piece together the story themselves) there was scope provided for the creation of an alterbiography (Calleja, 2011), where the player's own story was realised through direct interaction with gameplay as opposed to following a structured storyline. This was most common in games with a non-narrated protagonist which supported creativity through role playing activity such as *Final Fantasy XIV* (Square Enix, 2010) and *The Elder Scrolls V: Skyrim* (Bethesda Game Studios, 2011).

The greater number of *tools* related to the propensity for greater task flexibility (e.g. using different combinations of variables). In the example by one participant of *The Darkness II* (Digital Extremes, 2012), such interactable items were outlined in purple to draw the player's attention to them. In this way, games with a significant number of interactable items may advertise their perceived affordances (Cardona-Rivera & Young, 2013) through feedback such as hints or graphics to signify interactivity. Abilities such as blocking and throwing allowed the real affordances (Cardona-

Rivera & Young, 2013) of items to be realised – for example the ability to use a shield allows the use of a car door to afford blocking. In this way, creativity as problem-solving and appropriation could be supported through a greater number of game variables leading to different combinations of abilities and items. Furthermore, the introduction of new items and abilities at a steady rate, as opposed to all may help scaffold player creativity as players go through the game.

In terms of *environment,* the findings support the idea that many open-world games present a large ludic space (Aarseth, 2012) where players are encouraged to explore and discover. This was especially evident in games where designers had added additional details such as underwater life or hidden things. Furthermore, engaging in exploratory actions (Linderoth, 2013) with environmental objects such as manipulating light/dark mechanics (e.g. by moving into lit/unlit areas) can allow players to discover performatory affordances (Linderoth, 2013) such as in *The Darkness II* (Digital Extremes, 2012) where the light levels dictated which abilities could be used. The aesthetics of a game, such as beautiful environments, while not contributing to creativity within the game per se, could provide inspiration for creativity around the game both in the form of user-created content (Burri, 2011) (e.g. fanfiction, fan art) and ideas incorporated into non-game related creative hobbies. Finally, the realism of Artifical Intelligence (AI) behaviour could facilitate problem-solving through encouraging players to play more strategically and take risks – something which is echoed by previous work which suggests risk taking is an important element of creative behaviour (e.g. Sawyer, 2006; Seddon, 2005; Seddon & Biasutti, 2009).

Affordances for *content creation* related to the various ways which players could interact with a game through customisation and co-creation (Behr et al., 2016). In the examples provided of sandbox style games such as *Little Big Planet* (Media Molecule, 2008)*,* creativity could be supported with affordances for creating entirely new content such as importing media which the player has created. Even games which may not support the import of new content may encourage creativity through customisation, placement of objects and the ability to share creations with other players. However, as one participant pointed out objects needed to be interactable to fulfil their real use values, otherwise they didn't "add" anything to the game. Interpreting this using the cognitive theory of affordances for games (Cardona-Rivera & Young, 2013), objects need to accommodate the real affordances associated with those objects, otherwise there is a mismatch between the perceived affordance of the player, and the real affordance of the object (e.g. a chair which does not afford sitting).

Games could also support player creativity through providing affordances for *avatar* customisation, with games which afforded a variety of options for avatar appearance presenting

more opportunities for players to be creative in how they portrayed their avatar; something which is in line with previous work (Bailey et al., 2009; Behr et al., 2016; Dickey, 2007; Weber et al., 2014) which suggests that avatar customisation is a core part of player experience and an outlet for player creativity. Moreover, as Ward (2015) argues, opportunities for creation and further alteration to an avatar's appearance may help facilitate Mini C creativity, and provide support for a player's personal narrative or alterbiography (Calleja, 2011) as they can change their avatar appearance in line with their experiences as they progress through the game. In this way, games may support creativity as affective change by providing opportunities for players to construct avatars which reflect their personal understandings of their role and intent within the game.

Previous work has indicated that players prefer to play avatars similar to themselves (e.g. Ogletree & Drake, 2007; Trepte et al., 2011) and often strive for identification with their avatars in terms of gender (Behr et al., 2016). However, as one participant noted with reference to *Final Fantasy XIV* (Square Enix, 2010), while players are encouraged to be creative with avatar customisation, there are certain limitations on what kind of character can be created. While it may be impossible to cater for all customisation possibilities, games which offer stereotyped appearance options and limited gender options could detract from the emotional proximity players feel towards their avatars (Dickey, 2007), and the creativity involved in constructing their own personal narrative.

Game *progression* was not directly related to creativity per se, but instead supported player motivation. Intrinsic motivation has been argued to be a key component of creative behaviour (Amabile, 1990; Craft, 2005), and flow (Csikszentmihalyi, 1990) has been argued to serve as a pre-cursor for creativity (Cseh et al., 2015; Csikszentmihalyi, 1996). Appropriate hints when new abilities are introduced supports the development of player skill (Sweetser & Wyeth, 2005). In this way, hints both help in maintaining a flow state and scaffold player creativity by providing just enough information to encourage players to experiment with different items and abilities. On the other hand, echoing self-determination theory (Ryan & Deci, 2000) which argues that a key component of intrinsic motivation is autonomy, "pay to win" features could present a barrier to motivation by removing the autonomy involved in tackling challenges as they can no longer be overcome by the player's own ability.

Finally, supporting previous findings by Herodotou et al. (2014), the implementation of updates may not only renew the gaming experience, but also attract additional interest to the game. In this way DLC and expansions provide opportunities for *replayability* by adding more content for players to explore and appropriate. Furthermore, as Sotamaa (2010) notes, designing games was updateable and flexible platforms allows developers to host branded content alongside player

creations. As such, games may support creativity in the form of appropriation through various developer events such as content creation competitions. In this way, the player is involved in a dual role as a skilful creator, and member of the game audience.

5. Implications

This is the first study to the author's knowledge which uses the reflexive photography method within the context of digital games. In previous reflexive photography studies participants captured images using cameras or smartphones, however, in the current study participants used the in-built screen capture facility in many gaming platforms. By using a screenshot capture facility, participants did not face the same issues which other studies experienced in relation to physically taking photographs, and as such were minimally disrupted from their gaming activity. Feedback from participants regarding the reflexive photography method was positive with many citing it as being easy to use and that it did not detract from immersion in their gameplay. In this way, the reflexive photography method was both convenient for participants and useful for researchers in providing an immediate snapshot of creativity in practice. As such, future studies in the area of player experience may consider the use of the reflexive photography method.

Furthermore, several participants detailed that by taking part in the study, they were more aware of the way games influenced their creativity. By capturing screenshots at any given time, participants have the opportunity to identify particular screenshots which they wish to discuss and reflect upon during the photo-elicitation interviews. In this way, the use of the reflexive photography method provides a medium for creative reflection and has implications for researchers in using reflexive photography to study reflection in its own right.

This article outlined eight main design affordances which support different forms of player creativity. This provides implications for game developers who may wish to create a game which supports one or more forms of creativity. For example, many games are already designed with affordances for *content creation*, however, this article highlights how game can support a wider variety of creative expressions by players that are not solely concerned with user-created content. The eight affordances for player creativity could be integrated into both digital entertainment games and those designed with educational goals in mind to facilitate creativity. For example, if a game was designed to cater for creativity in the form of appropriation, developers could include affordances for *tools* such as a diverse range of items and abilities.

Finally, the design affordances outlined in this article may go towards providing an initial framework for the analysis of games in relation to their creative potential for players. The framework may benefit the fields of game studies and human-computer interaction by providing an account of how game design elements can support creative expression in different types of games. Furthermore, educators may wish to use this framework to choose games which support different forms of creativity – for example to foster creativity as affective change, games high in emotional challenge could be selected.

6. Limitations

As the reflexive photographic method has not been previously utilised in this field, the study presented a learning process in relation to the use of this method within this context and as such there are several notable limitations.

Firstly, there were some complications in relation to the timeframe in which participants took their screenshots. In previous reflexive photography studies, participants were given a set timeframe to capture their experiences (usually a week or two). However, in this study it was noted that the timeframe of a week felt restricting as some participants had creative experiences prior to their designated week, or else had pre-existing screenshots they wished to use. Future studies which wish to eliminate these timeframe issues could select participants who already document their experiences through screenshots, however, this does run the risk of only attracting participants who already engage in creative gaming pursuits and self-identify as creative individuals. Alternatively, future studies could designate a longer timeframe for participants to take their screenshots. With creativity being highly subjective and unpredictable, a longer period of time would eliminate some of the issues of a smaller timeframe.

Secondly, while feedback was positive as to the usefulness of reflexive photography in capturing aspects of creative play, several participants mentioned its potential for use alongside video footage. By capturing video footage of gameplay participants would not have to consciously think about taking screenshots or decide if an activity is worth screenshotting. While images provide a memory aid in which to discuss the creative moment, video footage would enable whole creative acts to be captured. However, it is worth noting that a significant amount of time would be required to analyse video footage depending on the number of participants. In this regards, future work which wishes to use both forms of data capture may be more suited to a scenario involving multiple researchers analysing the data.

Finally, this study does not claim to be generalisable to a wider population and presents only the experiences of the 9 participants involved. A range of different game genres were captured to attempt to provide a holistic account of the design affordances which support different forms of creativity, however, as there were only 9 participants and 32 screenshots, there is the possibility that with a larger sample size further genres and subsequent themes may be identified. Future studies may wish to obtain a greater number of participants, and to focus on design affordances for creativity in relation to a particular genre. Furthermore, future studies could focus on a specific gaming platform to determine if there are any unique affordances to that medium or limitations on what affordances can be implemented. This would aid generalisability and help refine the eight affordances documented in this article.

7. Conclusions

This article presented the findings from a reflexive photography study involving 9 participants. Building on previous research by Author A. (2020), eight main themes were developed to encapsulate the various design affordances which support player creativity in digital games.

Games could be designed to support creativity in the form of problem-solving and appropriation through affordances for *degree of flexibility* such task flexibility and multiple routes of play. Creativity as affective change was supported by affordances in *narrative* such as engaging storytelling, dialogue options and opportunities for the construction of personal narratives. *Tools* supported creativity as problem-solving and appropriation by providing opportunities for emergent combinations of game variables and a diverse range of movements to facilitate discovery. *Environment* supported creativity as problem-solving through opportunities to interact with environmental objects and facilitating strategic play through realist AI behaviour. *Content creation* provided opportunities for creativity as appropriation in relation to user-created content and implementation of modifications to enhance the gaming experience. *Avatar* supported creativity as affective change through providing opportunities for personalisation, experimentation of alternative identities, and altering avatar appearance to facilitate a player's personal narrative. *Progression* was not linked to any specific form of creativity per se, however, served a motivator for play through providing optimal challenges, appropriately timed hints and optional achievements. Finally, *replayability* supported creativity as appropriation by renewing the gaming experience through updates, patches, DLC and providing a medium for players to showcase user created content through developer events.

In essence, this article provides evidence of the effectiveness of the reflexive photographic method within the context of player experience. Furthermore, the eight design affordances outlined in this article illuminate how games may support a wider variety of creative forms – from user-created content, to the personal reflections on gaming narrative. In this regard, the findings from this research may not only provide a basis for guidance on game design for creativity, but also, provide a basis for the analysis of the creative potential of existing games.

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