# The ACE2 Model: Refining Bartle's Player Taxonomy for Creation Play

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## ABSTRACT

This paper proposes a new taxonomy of video-game players: the *ACE2 model*. Building upon related work in player taxonomies, the ACE2 model sets out to refine the established Bartle's taxonomy of player types by incorporating the aspect of *creation play* (e.g., as exhibited in modern games such as *Minecraft*), thereby rendering the refined model more generally applicable to present-day video games. The paper considers the model part of an ongoing investigation into the relationship between aesthetics and mechanics in games. As such, the contribution of this paper lies not in proposing a definitive answer to taxonomic demarcation, it foremost attempts to highlight a creative play dimension that could be considered under-explored in classic player taxonomies. A model-validation method to this end, is to allow human participants to identify the subjective demarcation of creation play in a user study, in which the aesthetic / mechanics expressiveness of games is assessed by participants. The paper reports on the results of a first user study, set to obtain an early indication of the model's validity, prior to extensive validation experiments. These first studies that compare Bartle's model with the ACE2 model indicate that (1) the ACE2 model allows for a more articulate labelling of single-player video games, and that (2) even though creation play does not feature often, when it does it is a defining feature in modern games. As such, the paper concludes by suggesting that (a) the descriptive expressiveness of the ACE2 model provides a substantial and functional refinement of Bartle's taxonomy of player types, and (b) further investigation of the interplay of aesthetics and mechanics – as experienced by game players – may yield important insight in (the taxonomic understanding of) creation play in games.

## 1 INTRODUCTION

Player modelling is a research area in game playing that is gaining attention from both game researchers and game developers. It concerns generating models of player behaviour and exploiting the models in actual play. The general goal of player modelling often is to steer the game towards a predictably high player satisfaction [35] on the basis of modelled behaviour of the human player (i.e., in-game and/or real-world behaviour). Moreover, next to being useful for entertainment augmentation, player models are useful (among others) for game design purposes (e.g., analysing whether the design leads to gameplay as envisioned by the designers), for simulation purposes (e.g., simulating stories or evaluating game maps), and for serious game applications such as education (e.g., tailoring the game to a player's model for reaching particular learning objectives) or health (e.g., personalizing games for rehabilitation of elderly patients).

Indeed, player modelling is of increasing importance in modern video games [16]. The main reason is that player modelling is almost a necessity when the purpose of AI is 'entertaining the human player' [35], with the human player and his/her affective response to a designed experience being largely unknown. One common method for player modelling, is to build on the established taxonomy of players by Bartle [5]. In general terms, the taxonomy demarcates between players being achievers, explorers, socializers, and killers. While the taxonomy is tailored to multi-user dungeon games (MUDs), the simplicity (and perhaps elegance) of the model render is somewhat suitable for application to modern video games as well [33].

However, there has been a fair amount of criticism on Bartle's model, noteworthy also by Bartle himself, who states that his taxonomy might be incomplete for games other than multi-user dungeon games [7]. Indeed, games have evolved substantially since 1996, with new manners of behaviour being exhibited which are not encapsulated in Bartle's taxonomy of player types. While numerous alternative models are investigated (e.g., Yee's seminal work on MMPORPG's [37], the Four Keirsy Temperaments [21]; the Demographic Game Design model [9]; and the Unified Model [33]) – as discussed further in the related work section – we observe that the alternatives do not explicitly consider a vital aspect of numerous modern video games, namely the aspect of *creation play*. Here, we consider creation play to be exhibited play behavior with no explicit purpose other than to build or create whatever the player desires – and will further demarcate the term in the next section. Broadly formulated, creation play is play behaviour beyond the traditional explorer type – that is also (a) interacting (b) with the game world – but done so for (often purposely) exploratory or goal-directed reasons, while creation play can be consider play behaviour without explicit purpose.

Indeed, the popularity of sandbox games such as *Minecraft* reveals that there is a strong desire for games that allow such expression. Furthermore, related work reveals that so-called sandbox players are motivated by a unique set of motivators that are not reflected in any existing player model [13, 36]. Throughout the course of the paper – and building upon a user-study – we will therefore advocate that the creation aspect of games should be seen as its own distinct category.

As such, this paper contributes a new taxonomy of video game players: *the ACE2 model*. Founded on related work in player taxonomies, the ACE2 model refines the established Bartle's model by incorporating the aspect of creation play, thereby rendering the refined model more generically suitable for present day video games.

## 2 RELATED WORK

The relationship between aesthetics and mechanics may be considered a foundational theme of game studies. It has already been discussed widely, for example, in terms of core and shell [26], aesthetic qualities and formal structures [29], visual appearance and procedural rhetoric [11]. One may correctly note that the exact nature of this relationship has been discussed in term of "tight coupling" [10], "seeing past fiction" [22], or a relationship in which a fictional surface layer helps the player understand the game's goals, and then fades to the back of the mind [20].

This paper attempts to tread carefully on these complexities, as they indeed cannot simply be reduced to an either/or: the player can care for both aesthetics and mechanics. A tinkering creator can care for mechanics; building something can be both an "aesthetic" act as it can be a "mechanical" act.

As such, the contribution of this paper lies not in proposing a definitive answer to taxonomic demarcation, it foremost attempts to highlight a creative play dimension that could be considered under-explored in classic player taxonomies. A model-validation method to this end, is to allow human participants to identify the subjective demarcation of creation play in a user study, in which the aesthetic / mechanic expressiveness of games is assessed by the participants. Thereby, one may indeed highlight the nature of creation play, which may arguably be a unique play dimension between aesthetics and mechanics.

To provide further context for the paper, we will go further into (1) Bartle's taxonomy of player types, (2) alternative player models, and (3) will provide concise context on the topix of player modelling.

### 2.1 Bartle's taxonomy of player types

Barte's taxonomy of player types was derived from the author's investigation into why people play MUDs. That is, when summarising the contents of his investigation Bartle saw a pattern emerging; most reasons for playing could be grouped up in four distinct player categories [5], illustrated in Figure 1. Bartle constructed two axes to map the four categories, based on the sources of interest that each player category has in the game. On the x-axis there is a focus on players on the left, versus a focus on the game world on the right. The y-axis goes from a focus on acting at the top, to a focus on interacting on the bottom. The player types are situated in the quadrants associated with their interests. An informal description of the categories is as follows.

*Achievers* focus on acting on the game world, which boils down to doing things in the game. They care little about the other players in the game, or about the intricacies of the game if it does not result in them gaining more points. *Explorers* are interested in interacting with the game world, always looking for new things in the game. They thrive on being surprised by the game, but not so much by other players. *Socialisers* focus on interacting with other players. They want to get to know new players and engage in social activity with them. For them, the game world is mostly a backdrop to their social engagements. *Killers* are looking to impose themselves on others, acting on players rather than the game world. They thrive on demonstrating how superior they are to other individuals.
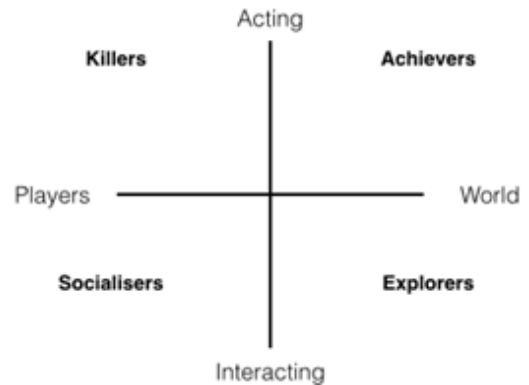


**Figure 1: Bartle's taxonomy of player types [23].**

*Strengths of Bartle's Taxonomy.* Perhaps one of the biggest strengths of Bartle's model is its simplicity. With just four player types, divided over two distinct axes it is easy to comprehend and intuitive to use. Additionally, the use of a scale allows for player models to have varying degrees of interest in the aspects of the game. A player is usually not limited to one style of play, and can dabble in other styles from time to time. Bartle's model can account for this by assigning values to each of the axes for a player, creating a multi-dimensional model rather than just a single player type. The fact that classifications similar to that of Bartle are widespread also adds merit to the quality of this type of classification. As Stewart notes, a great deal of player models are very similar to Bartle, and thus to one another [33]. Further on in this paper we will take a closer look at these other models. In addition to scientific player models, there are also industry examples of companies that use a classification which shares similarities with Bartle's model.[1]

*Shortcomings of Bartle's Taxonomy.* The main shortcoming of Bartle's Taxonomy of Player is that it is tailored for multi-user dungeon games (MUDs), and not present-day video games. This has made it difficult to use the model in games that are distinct from its original design-purpose, even Massive Multiplayer Online Role-Playing Games, which share many similarities with MUDs [7]. Indeed, applicability of the model is further reduced by the fact that MUDs (and Massively Multiplayer Online games in general) are steadily declining in popularity [8]. Pigeonholing Bartle's model even further is the fact that it was developed based on an online multiplayer game. This means that all games which focus more on delivering a *single player experience* are hard to classify using Bartle's model.

### 2.2 Alternative Player Models

Indeed, numerous other models exist that aim to categorise players by their playing style.

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[1]Noteworthy is the model employed by Wizards of the Coast in their design of new cards for Magic: The Gathering [28]. They use a cast of three player types: Timmy, Johnny, and Spike, which roughly correspond to Bartle's Socialisers, Explorers, and Achievers. In addition, they also allow for players to associate with multiple playing styles in varying degrees of intensity. A possible reason for not having a Killer equivalent in the model Wizards of the Coast employ might be that the multiplayer aspect of the game is in most cases mutual. Players agree to play a game with each other, whereas in MUDs the players are placed in a game with random other players.

Yee's seminal work on MMORPG demographics, motivations and experiences [37] relates to the present research too. That is, an exploratory factor analysis revealed a five factor model of user motivations for MMORPG game – achievement, relationship, immersion, escapism and manipulation – illustrating the multi-faceted appeal of these online environments [37]. Indeed, the multi-faceted appeal of games may be particularly present in single player games too, and may not be appropriately captured by Bartle's model.

Tuunanen and Hamari's work [17] – while not directly focused on the descriptive expressiveness of a model, but on how players have been categorized in game research literature – also provides relevant input to our investigation. Their study suggests that player typologies in previous literature can be synthesized into seven key dimensions: skill, achievement, exploration, sociability, killer, immersion and in-game demographics [17]. These additional dimensions of player categorisation indicate, as we also do in the present paper, that important dimensions of player expressiveness (and thereby, player-driven game categorizations) are not fully addressed in established player taxonomies.[2]

Also, a particularly interesting model is the *Four Keirsy Temperaments* [21], which uses a categorisation very similar to Bartle's. These were not derived from people playing games, but rather a pattern Keirsey observed from the sixteen types of the Myers-Briggs personality model. These four categories are high level constructs of personality traits, which can be seen as a superset of Bartle's player types [33]. Even though Keirsey's Temperaments are not specifically tailored to games, they do allow for categorisation based on the type of behaviour a person exhibits in the world, or in a game world [33].

Another four type model is the model constructed by Bateman, the *Demographic Game Design model* (DGD1) [9]. Through observation of video games Bateman came to four player types that are all slightly different from the four Bartle types. However, as Stewart notes, it is possible to construe the types of the DGD1 model as hybrids of the Bartle types [33]. By elaborating on the Hardcore and Casual modes described by Bateman [9], Stewart [33] created six types that function as all possible hybrid combinations of the Bartle types.

Finally, an interesting model is the *Unified Model*, by Stewart [33]. This model incorporates the different player models that we already touched upon in the previous paragraphs. He shows that a number of the most well-known player models as well as game design models share so many conceptual elements, that – conceptually – it is possible to combine them all in a single model [33].

However, in all the different aforementioned models we observed that most did not explicitly deal with the *creation play* aspect that some players enjoy in video games.[3] The popularity of sandbox games such as *Minecraft* indicates that there is a desire for games with no explicit purpose other than to build or create whatever the player desires. Most models regard building as a component of
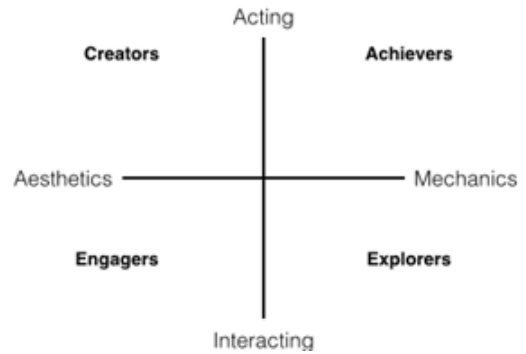


Figure 2: ACE2 taxonomy of player types.

simulation, where the player wants to copy something from the real world. While the unified model does consider creative building, it is shoehorned into Bartle's explorer category [33]. Indeed, research has shown that sandbox players are motivated by a unique set of motivators that are not reflected in any existing player model [13, 36]. As such, we would like to argue that the creation aspect of games should be seen as its own separate category.

## 2.3 Player Modelling

Player modelling is a research area that focuses on analysing how players go about in playing the games that they play, and then using this information for various ends [14, 18, 27, 34]. In this context, player modelling is generally concerned with four goals, namely (1) providing an interesting or effective experience on the basis of player models, (2) creating a basis for game developers to personalize gameplay as a whole, (3) creating new user-driven game mechanics, and (4) allowing the game developer to analyse how distinct groups of players interact with and respond to the game design [4]. In this paper, we will exclusively investigate the construction of models based on behaviour that is exhibited by a player within a game environment.

Noteworthy of the present paper, is that it analyses which games facilitate which specific play behaviours, according to both Bartle's reference model, as the new ACE2 model. Such an analysis reveals both the expressiveness of the investigated models, and indicates which player styles are facilitated within a games. Particularly this later aspect of player models, makes them applicable for use within the game development process [27, 34] and for game analysis [5, 33].

## 3 THE ACE2 MODEL

We propose a new taxonomy of video game players: the ACE2 model. Building upon previous work in player taxonomies, ACE2 refines the established Bartle's model by incorporating the aspect of creation play, thereby rendering the refined model more generically applicable to present day video games. Figure 2 illustrates the axes and player types in the ACE2 model. At surface level, one observes that it is reminiscent of Bartle's taxonomy of player types, at least with respect to it utilising two axes and four player types. Below we discuss the motivation and design choices for the axes and player types.

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[2]Tuunanen and Hamari's go so far as suggesting the self-fulfilling and self-validating nature of the current player taxonomies, because their relatively high use in game design practices – as well as discusses – the role of game design in segmentation of players [17].

[3]On a historic note, one may observe that Caillois already showed awareness of the category of "construction games", which he subsumed under mimicry [12]. The historically interested reader may also appreciate Liboriussen's application of craft theory to game studies [25].

## 3.1 Horizontal axis

As observed earlier, part of the weakness of Bartle's model lies in the fact that it is geared towards a very specific kind of game: MUDs. Since we wanted to create a model that was applicable to a wider variety of games we took a more abstract approach to games. However, we quickly observed that the multiplayer aspect of games adds numerous intricacies to the kinds of behaviour that players display, that we decided to restrict the model to single-player games. Indeed, this is a design choice that allows for a greater balance between model simplicity and model articulation than would have been possible had we included all kinds of games.

As Bartle's x-axis dealt with the distinction between the virtual world and its player inhabitants, we were no longer able to incorporate this axis. Instead we consider the axis to deal with different ways of players enjoying games. Indeed, there are numerous reasons why players enjoy playing games [2, 24], and these can reasonably be abstracted into two main categories which we labelled Aesthetics and Mechanics. Whilst the term Aesthetics is also used in the MDA model [19], here, we consider aesthetics to be the aesthetic elements of the game that do not belong to the gameplay. That is, e.g., the narrative of a game, its visual style (or lack thereof) [31], the soundtrack, etc. etc. On the other side of the axis we place the Mechanics, which are the elements of the game that comprise the gameplay of a game, such as the actions that the player can perform in the game world, or the interaction between game elements.

## 3.2 Vertical axis

The vertical axis is exactly the same as it is in Bartle's model, since we observed that the distinction Bartle [5] makes between acting on the game world and interacting with the game world is explicitly (and particularly) present in single player games.

## 3.3 ACE2 Types

We will now describe all four player types of the ACE2 model, of which the model derives its name (Achievers, Creators, Explorers, Engagers).

*3.3.1 Achievers. .* The achievers in this model are closest to their Bartle counterpart, since they focus on acting on the game mechanics, which is similar in spirit to Bartle's achievers, who act on the game world. ACE2 achievers enjoy winning and gaining points like Bartle's achievers, but also enjoy obtaining mastery over the mechanics of the game. An example of mastering mechanics would be the ability to flawlessly execute complex combos in a fighting game, or perfectly time a jumping sequence in an action game. This way of enjoying games is not touched upon by Bartle.

*3.3.2 Explorers. .* The explorers closely resemble Bartle's explorers. They also seek to learn about the game's intricacies and quirks, but are more focused on the gameplay itself. Exploring terrain is not as interesting to them as it is to Bartle's explorers. They will often look for interesting interactions in games, such as unique combo's in deck building games, such as Hearthstone, or novel use of game mechanics. An example of the latter is 'snaking' in Mario Kart DS, a technique that uses the drifting mechanic, which was intended

for taking corners, to increase the speed of the vehicle on straight sections of the track as well.

*3.3.3 Engagers. .* Engagers are the first completely new type, and focus on interacting with the aesthetics of the game. They are more interested in the story or views a game provides, and not so much the gameplay. They will often look for games that trigger an emotional response, or that allows them to form an emotional bond with the characters in the game. Interactive novels are an example of games that resonate with this player type, as these often provide minimal gameplay but instead deliver a rich aesthetic experience.

*3.3.4 Creators. .* Creators are the final player type in this model, and are also the type that sets the ACE2 model apart from most other models. While this kind of behaviour is often a minor part of a different category, or even completely disregarded, here it has its own player type. While these may appear counter intuitive, creators – like engagers – are drawn towards the aesthetics of a game, but seek to act on them rather than interact with them. This manifests as creating structures or visuals within the game, effectively using the game as a creative outlet. Creators can also use the game to create their own aesthetic experience as to trigger an emotional response in others who experience their work.

## 4 EVALUATION OF THE ACE2 MODEL

In order to analyse the conceptual refinement offered by the ACE2 model, we perform a user study in which the model is compared to Bartle's taxonomy of player types. The user study consists of a series of questionnaires in which participants were asked to rate how strong the focus on a particular kind of behaviour was in selected games. By looking at how the focuses are divided for both models we were able to compare the descriptive expressiveness of the models on the selected games. Here, we will fist describe (1) which modern video games were include in the study, (2) discuss the design of the questionnaire, and (3) present the experimental procedure.

## 4.1 Investigated Video Games

To ensure the inclusion of a wide variety of modern video games, we created a list of well-known games from many distinct genres. The existence of strictly-defined game genres is an ongoing topic of debate in the scientific community, despite the fact that the notion has been around for many years now [1]. For the purpose of the current investigation, we adopt the following commonly accepted game genres Action, Adventure, Role-playing, Simulation, Strategy (cf. [3, 15, 30, 32]), and Sandbox (cf. [36]). Indeed, a sandbox game is unique game genres in which the goals are set by the players themselves, which is why a pure sandbox game attracts a specific kind of player [36].

For each genre we selected three games in an attempt to cover as many of the sub-genres as possible. Some of the selected games were part of a series in which multiple games were nearly identical in terms of the gameplay they provided. In such cases all these games were grouped under the series. Table 1 shows a comprehensive list of all games considered for this study.

**Table 1: List of the videos games that were included in the user study.**

| Genre | Archetypal game series | Matching inclusion criteria |
|---|---|---|
| Action | Super Mario Bros. | Super Mario Bros., Super Mario Bros. 2, Super Mario Bros. 3, New Super Mario Bros, New Super Mario Bros. 2, New Super Mario Bros. Wii, New Super Mario Bros. U. |
|  | Street Fighter | Street Fighter IV |
|  | Halo | Halo III and Halo IV |
| Adventure | Sam & Max series | Sam & Max Save the World, Sam & Max Beyond Time and Space, Sam & Max: The Devil's Playhouse |
|  | Tales of Monkey Island | Launch of the Screaming Narwhal, The Siege of Spinner Cay, Lair of the Leviathan, The Trial and Execution of Guybrush Threepwood, Rise of the Pirate God |
|  | The Walking Dead | Season 1: A New Day, Starved for Help, Long Road Ahead, Around Every Corner, No Time Left, 400 Days. Season 2: All That Remains, A House Divided, In Harm's Way, Amid the Ruins, No Going Back. |
| Role-playing | Baldur's Gate | Baldur's Gate, Baldur's Gate II, or their Enhanced editions. |
|  | PokÃľmon | Red, Blue, Yellow, Gold, Silver, Crystal, Ruby, Sapphire, Emerald, FireRed, LeafGreen, Diamond, Pearl, Platinum, HeartGold, Soulsilver, Black, White, Black 2, White 2, X, Y, Omega Ruby, Omega Sapphire. |
|  | Final Fantasy | VII, VIII, IX, X, X-2, XII, XIII, XIII-2, Lightning Returns: Final Fantasy XII |
| Simulation | Sim City | Sim City 2000 and Sim City 3000 |
|  | Euro Truck Simulator | Euro Truck Simulator and Euro Truck Simulator 2 |
|  | Nintendogs | Nintendogs: Dachshund & Friends, Lab & Friends, Chihuahua & Friends. Nintendogs: Best Friends, Dalmatian & Friends. Nintendogs + Cats: French Bulldog & New Friends, Golden Retriever & New Friends, Toy Poodle & New Friends. |
| Strategy | Civilization | Civilization IV, Civilization V |
|  | StarCraft | StarCraft, with or without the expansion Brood War, StarCraft II: Wings of Liberty, and StarCraft II: Heart of the Swarm |
|  | Portal | Portal, Portal 2 |
| Sandbox | Minecraft | Minecraft |
|  | Garry's Mod | Garry's Mod |
|  | Terraria | Terraria |

## 4.2 Investigated Facets

All items in the questionnaire took the form of a question about how strong – according to the participant – the focus was in the game in question (e.g., "How strong is the focus on beating levels or opponents in the game"). The participant could answer on a five point Likert scale ranging from "Very Strong" to "Barely There". In addition, participants could also answer "Not Applicable" should they feel the item was not relevant to the game in question, or "Can't Remember" should they be unable to remember whether said element was present in the game or not. A list of facets investigated in the questoinnaire is provided in Table 2.[4]

Investigated facets applicable to Bartle's model are: Achievers (A1, A2), Explorers (A4, A5), Socialisers (A8, A9), Killers (A10, A11). Investigated facets applicable to the ACE2 model are: Achievers (A1, A2, A3), Explorers (A4, A6, A7), Engagers (A12, A13, A14), Creators (A15, A16, A17). Since we constructed our own items for this questionnaire we were very mindful of the fact that we could influence the results favourably for ACE2 just by how we chose the

items. To prevent this we took special care to solely focus on the actual behaviours we observed in commonly-available gameplay footage, rather than on what would best differentiate the new model from Bartle's model.

## 4.3 Questionnaire Procedure

Upon loading up the questionnaire the participant was greeted with an introduction screen where the goal of the questionnaire was briefly explained, as well as explaining what was expected of the participant in their answering of the questions (Appendix B). When starting the questionnaire, the participant was presented with a screen in which one could select the games with which they felt comfortable enough to answer questions about (Appendix C). For every selected game the participant was asked to fill in the questionnaire investigating applicable facets (Appendix A). In addition to the questions, the screen also showed the games in question, and a small reminder on how to judge certain questions.

For this first user study, set to obtain an early indication of the model's validity, 43 game players participated. Selection of the participants took place via convenience sampling of subject who

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[4]In addition, the Appendixes – available online at http://bit.ly/1nNDH0N – provide a full overview of the investigated questions and the accompanying results.

**Table 2: List of facets investigated in the questionnaire.**

| Facet | Type | Category | Description |
|---|---|---|---|
| A1 | Achievers | Winning | Beating levels or opponents in the game |
| A2 | | Gaining points | Increasing a value, be it experience points, gold, achievement points, or anything similar |
| A3 | | Mastering the game | Getting better and better at the game. The learning curve is a large part of the game |
| A4 | Explorers | Finding interaction between game elements. | Discovering how game elements interact with each other, finding the limits of the game engine |
| A5 | | Finding unexplored territories | Discovering areas in the game that few other players have been to |
| A6 | | Finding alternate strategies | Beating levels in different ways than what is most obvious; finding new ways to accomplish something |
| A7 | | Finding the optimal solution or setup | Finding the optimal solution for a puzzle, or finding equipment/weapon combination that provide the best boosts |
| A8 | Socialisers | Getting to know new players | Meeting new players and communicating with them to get to know them better |
| A9 | | Improving your social status in the community | Getting more players to know you and see you in a positive light |
| A10 | Killers | Causing distress in other players | Interacting with other players in the game world as to ruin their day. Often by killing their in game character |
| A11 | | Imposing yourself on other players | (Forcefully) Interacting with other players in the game world |
| A12 | Engagers | Experiencing the narrative of the game | The game features an extensive story |
| A13 | | Experiencing the visuals of the game | The game provides stunning views, or features a particular art style |
| A14 | | Interacting with the Non-player Characters of the game | Engaging in dialogue with computer controlled characters, or in other ways interacting with them |
| A15 | Creators | Creating new levels. | Constructing new levels that are playable by others |
| A16 | | Creating your own structures, landscapes, or visuals | Using the game as a creative outlet. An example of visuals would be pixel art |
| A17 | | Creating your own narrative | Creating your own story for a custom campaign, or using the game to create a movie (machinima) |

fit the following criteria (1) the subject plays games more than zero hours per week, (2) the subject at least a moderate game literacy, in being knowledgable and having personal experience with numerous classic game (e.g., Super Mario). The average age of the participants was 23 years. For this preliminary study no data on gender was collected for analysis.

## 4.4 Questionnaire Analysis

When analysing the results we transformed the answers given by the participants into their assigned ranks, which were averaged over the collected entries for the specific game / category. In the case a participant answered "Can't Remember" we did not take this answer into account in the average. This gave us a score for every category for both models, which we mapped on the plots shown below. The scores range from 0 to 5, where 0 means that this player type is not represented in the game at all according to the participants, and 5 that this is one of the main foci of the game. The reasoning behind this is that – while not a marker for model evaluation – it allows for a game to be visually identifiable through their shape on the plot, as well as making for an easier visual comparison of differences between the models in the results.

## 5 RESULTS

First we will discuss how the models compare over all games, looking at an overall analysis of the data. Second, we will take a closer look at each of the genres and how well the models are able to categorise their expressiveness.

## 5.1 Global analysis

By calculating the average for all player types among all games for both models we were able to create the plot that can be observed in Figure 3. The socialisers and engagers, as well the killers and
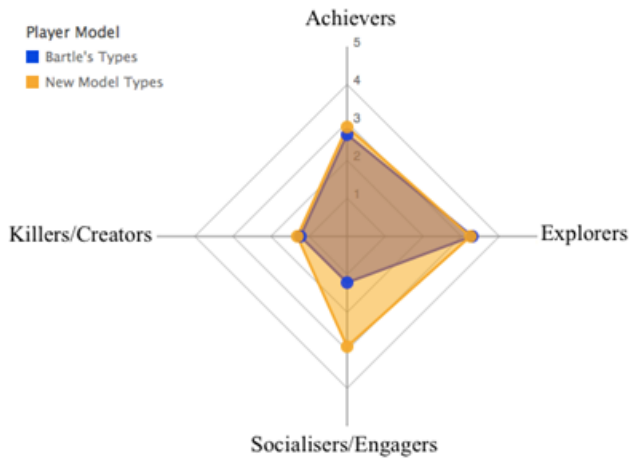
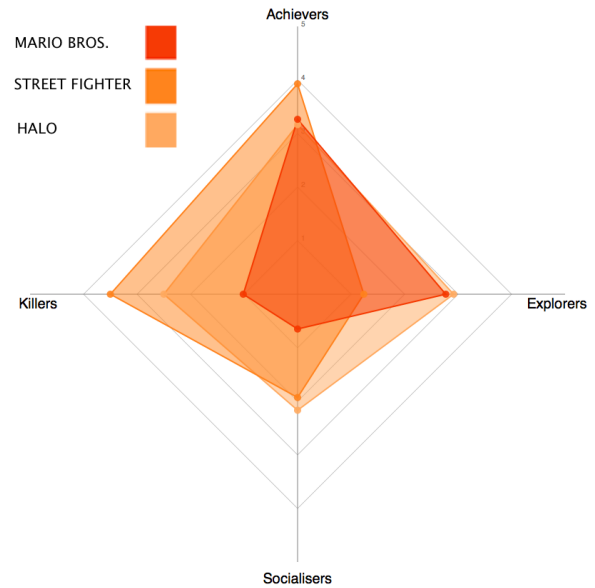Figure 3: Global visualisation over all investigated games.



Figure 4: Action games in Bartle's model. The three profiles have very distinct shapes, which makes it difficult to create an abstraction for action games using Bartle.
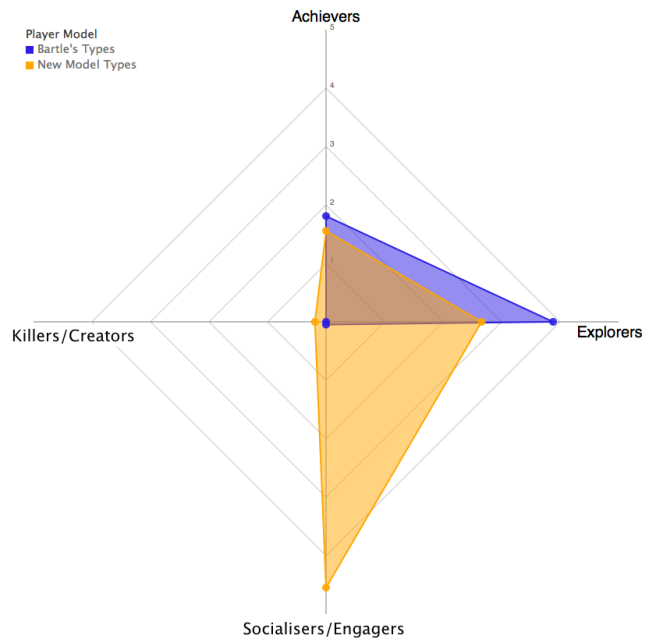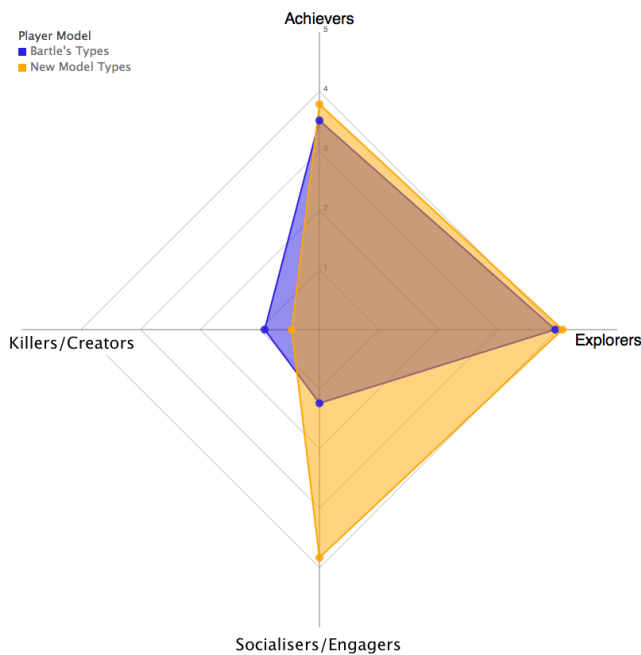


Figure 5: Adventure games in both models. Bartle's model utilizes only two axes, whereas ACE2 utilizes three, allowing for more articulation.

creators have been put on the same ends of the axes in order to make comparison easier. While the two shapes are similar, the ACE2 model has three directions in which it expands, whereas Bartle's model only expands in two directions substantially. This indicates that participants were able to categorise with a higher degree of articulation in ACE2, since more relevant options were available to them. Appendix G1 plots the results for all games individually using Bartle's model. We observe that for Bartle's model that the killer and socialiser axes are sparsely populated with medium to low scores. Appendix G2 also plots the data for the individual games, but using ACE2 instead. We see that the achiever, explorer, and engager axes are densely populated with high scores for the ACE2 model. While the creator axis is sparsely populated, a select number of values scores quite high, which suggests that for the games in which the *creator* aspect was relevant, it was highly relevant according to the participants. This results suggest that the descriptive expressiveness of the ACE2 model substantially outperforms that of Bartle's taxonomy of player types.

## 5.2 Genre-specific analysis

*Action games.* Appendix H1 plots the averages of the data for action games for both models. We observe a slight difference between the two models. Overall, the Bartle killers are more relevant for action games than the ACE2 creators, but not significantly so; $p < 0.07$. However, when observing action games individually it becomes clear that ACE2 allows for a better abstraction of action games, since all three games share a similar profile. This is unlike Bartle's model, of which the results can be observed in Figure 4.

*Adventure games.* Both models generate unique profiles for adventure games, as is illustrated in Figure 5. However, Bartle's model only utilises two of the four axes, whereas ACE2 uses three. This allows for a higher degree of articulation in the categorisation of adventure games in ACE2.

*Role-playing games.* Like adventure games, role-playing games all have similar shapes and are thus close to their average for both

models. Bartle mainly utilises two of the axes, but it does not completely ignore the other two axes. The ACE2 model is again capable of showing more articulation by using three axes, but the creator axis is almost completely ignored, as is illustrated in Figure 6.

Figure 6: Role-playing games in both models. Bartle's model utilizes only two axes, whereas ACE2 utilizes three, allowing for more articulation.
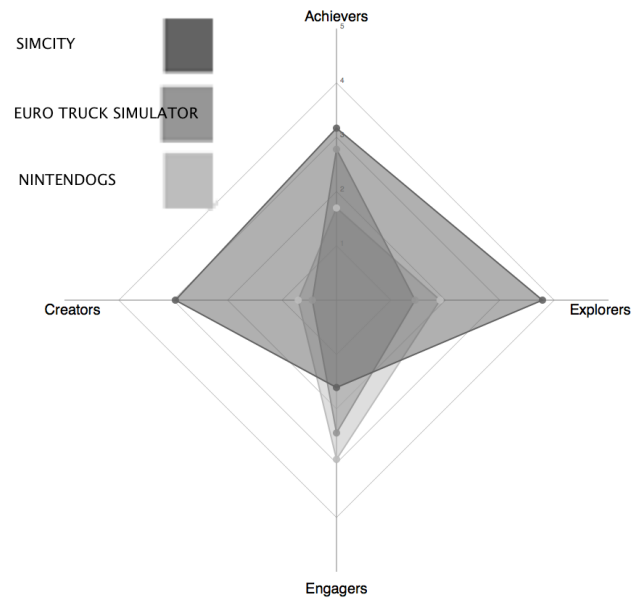


Figure 7: Individual simulation games in ACE2. Sim City clearly differs substantially from the other two games.



Figure 8: Strategy games in both models. Bartle's profiles is quite similar to the profiles for other genres.

*Simulation games.* Simulation games feature quite distinct shapes in both models, although all scores across both models are on the lower side. It seems that simulation games do not fit either model quite as well as other genres. When considering the games individually a clear outlier can be observed in *Sim City* in the ACE2 model. This is illustrated in Figure 7. We will investigate this in more detail in the discussion section.

*Strategy games.* In Bartle's model strategy games have a profile that is quite similar to other genre profiles, whereas ACE2 produces a more unique profile. Figure 8 shows both profiles, and when compared to Figures 3 and 6 it is clear that Bartle's model is not well suited for creating abstract genre profiles.
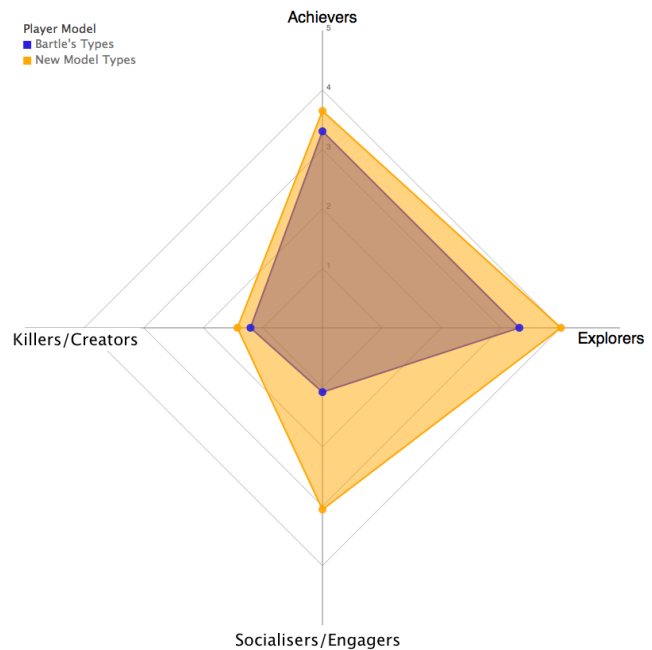
*Sandbox games.* Sandbox games generate distinct patterns in both models (Figure 9), making them easily identifiable. The Bartle model shows a little more variance in the individual games than ACE2. When looking at the creators axis in the individual games (Appendices H3-M3), we can see that with a single exception all high scores are in the sandbox genre. The one exception is in simulation games, where the city builder Sim City also scores high on the creators axis. The difference in scores on the creators axis for sandbox game and any other genre is significant, with an unpaired t test – and initial data indicating a Gaussian distribution – yielding a value of $p < 0.04$ for sandbox versus simulation, and $p < 0.003$ for sandbox versus other genres.

## 6 DISCUSSION

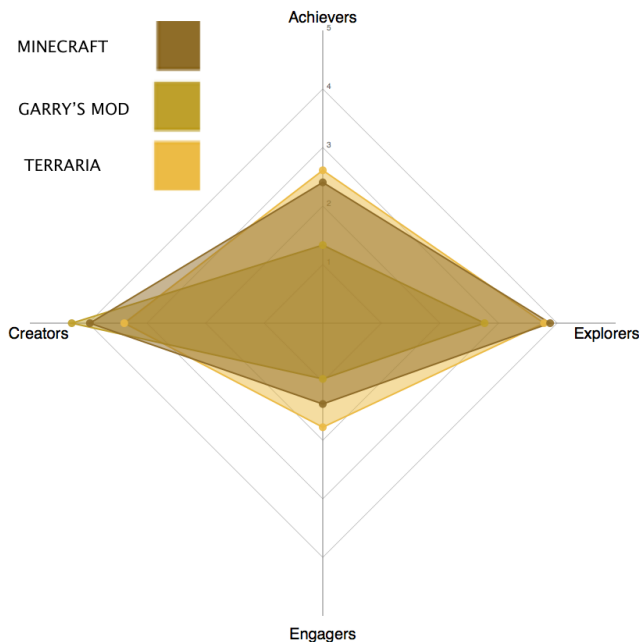To conclude the present study, we feel it is important to discuss several limitations of the investigation, as they link to interesting future work (6.1), and wish to discuss several general observations that support the intuition that creation play is an important aspect in recent video games, and as such should by design be incorporated in player taxonomies.

**Figure 9: Sandbox games in ACE2. All three games score highly on the creators axis.**

## 6.1 Limitations

In the present paper, Bartle's player taxonomy is purposely leveraged to provide a means for initial comparison of a revised model that intentionally – and by design – incorporates a 'creation play' aspect within its taxonomy. While Bartle's taxonomy of player types as a starting point indeed does not provide the basis that more recent models offer in terms of scientific embedding in personality theory (see Section 2.2), Bartle's taxonomy of player types however still provides a solid means for comparative analysis of conceptual revisions; the comparative analysis can thereby be focused not so much on model validation, but on what we are interested in foremost: the subjectively-experienced (creative) expressive range of video games as a factor of distinct player types.

We must also consider that Bartle himself proposed a so-called 'hacker' player type in his later work [6]. While to some degree this player type tinkers with available game mechanics, a hacker player does so purposely, as compared to play with no explicit purpose other than to build or create whatever the player desires.

Finally, we acknowledge that while gender information is not encapsulated in this preliminary work – which focused on obtaining an early understanding of creation play as an important facet of a game's expressive range – analysis along gender lines is certainly a point of interest in subsequent investigations.

## 6.2 General observations

When comparing the various axes with unpaired t-tests across various genres we found very little significant differences, even though by observing the graphs there seems to be a substantial difference. An explanation for this is that it seems not all participants understood that the questionnaire was focused exclusively on

single-player games and thus still used Bartle's killers and socialisers, whilst one would assume that these play no role in single-player games. However, the creators type forms the exception to this, showing an overall highly significant (p < 0.04) difference between the sandbox genre and others. This supports our hypothesis that the creative player is a unique kind of player that should be considered separately from other player types.

Focusing on the creative type, we want to briefly reflect on the ACE2 outlier in the simulation games, *Sim City*. Due to their nature, simulation games will often borrow elements from other game genres in order to create the best simulation. In the case of Sim City, which is a city builder type game, it is no surprise that the creator player type is strongly represented whereas it is not in the other simulation games. The answers for the items pertaining to the creator type for *Sim City* differ significantly from those for the other two simulation games, *Euro Truck Simulator* and *Nintendogs*, with p < 0.0133. This strengthens our hypothesis that creative gameplay is worth considering separately even further.

Lastly, while none of the results were significant, we did find that the ACE2 model made it easier to differentiate between genres by eye. When looking at Figure 10, the three shapes in Bartle's model are nearly identical even though they belong to very different genres. This is more accurately reflected in Figure 11, where the three games feature have distinct shapes, allowing for simple and intuitive identification when observing the data. This shows us that while the differences might not appear substantial on the surface, the models do offer clear use in creating intuitive comparisons that can help people in finding similarities and differences between games.

## 7 CONCLUSION AND FUTURE WORK

This paper proposed a new taxonomy of video-game players: the *ACE2 model*. Building upon related work in player taxonomies, the ACE2 model sets out to refine the established Bartle's taxonomy of player types by incorporating the aspect of *creation play* (e.g., as exhibited in modern games such as *Minecraft*), thereby rendering the refined model more generally applicable to present-day video games. The paper considers the model part of an ongoing investigation into the relationship between aesthetics and mechanics in games. As such, the contribution of this paper lies not in proposing a definitive answer to taxonomic demarcation, it foremost attempts to highlight a creative play dimension that could be considered under-explored in classic player taxonomies. A model-validation method to this end, is to allow human participants to identify the subjective demarcation of creation play in a user study, in which the aesthetic / mechanics expressiveness of games is assessed by participants. The paper reported on the results of a first user study, set to obtain an early indication of the model's validity, prior to extensive validation experiments. These first studies that compare Bartle's model with the ACE2 model indicated that (1) the ACE2 model allows for a more articulate labelling of single-player video games, and that (2) even though creation play does not feature often, when it does it is a defining feature in modern games. In conclusion, it is suggested that (a) the descriptive expressiveness of the ACE2 model provides a substantial and functional refinement of Bartle's
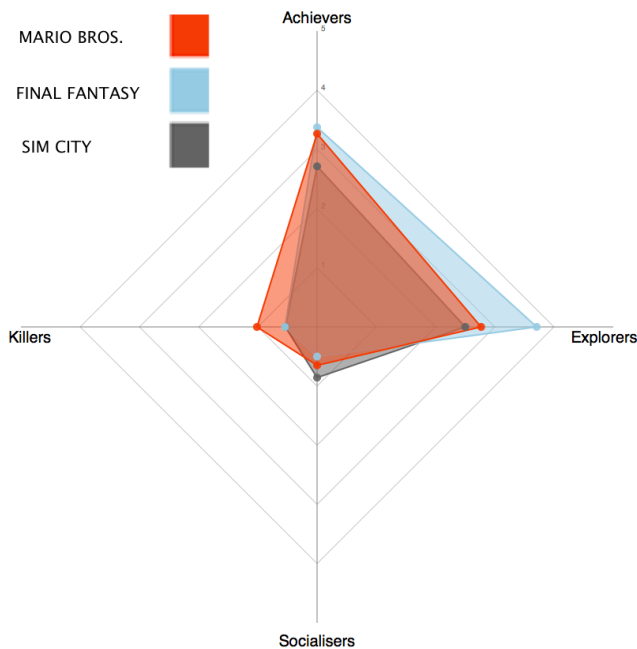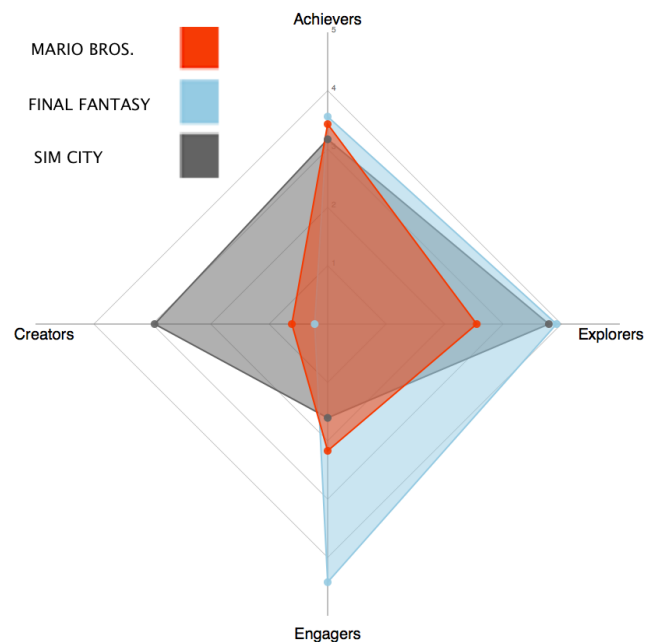
**Figure 10: Super Mario Bros., Sim City, and Final Fantasy in Bartle's model. We observe that all three games score similar on the four axes despite belonging to three different genres.**



**Figure 11: Super Mario Bros., Sim City, and Final Fantasy in the ACE2 model. We observe that the three games yield unique profiles on the four axes.**

taxonomy of player types, and (b) further investigation of the interplay of aesthetics and mechanics – as experienced by game players – may yield important insight in (the taxonomic understanding of) creation play in games.

To do so, for future work, we will build upon the insights of the present paper, and will perform extensive validation experiments and data analysis that will draw correlates of creation play aspects of gaming, to how distinct players perceive the aesthetics / mechanic expressiveness of games – therein investigating the effect of player characteristics and personality, and game literacy.

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