Beyond the Digital Divide: An Ecological Approach to Game-Play

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Introduction

It appears that digital games present a number of significant problems as artifacts for intellectual analysis. A great deal of effort has been invested in attempts to define *digital game* and to position these games historically in relation to text, media, play, literature, drama, and other categories. Are we to understand games as related to other screen-based media and place them in the same media ecology as movies? Are they thus historically related to theatre and drama? Can we see digital games as a form of interactive television? Does it make more sense to place digital games in a broader framework of studies on play? Are digital games related to sports, and, if so, in what way? The field of studying games sometimes also describes its own historical roots in terms of the so-called ludology-narratology debate. This discussion has involved the status of stories in digital games and questioned whether rules or fiction should be the appropriate unit of analysis for understanding them (see Eskelinen, 1999; Frasca, 2003; Pearce, 2005; Murray, 2005).

How a scholar chooses to position digital games has consequences for what can be seen as relevant research questions, appropriate methods, and whether or not the results of a given study are a true contribution to our understanding. For example, framing video games as 'media' will make the game a vessel for some 'content,' and emphasis will be on how the game mediates a certain theme. A game like *The Sims*

(Maxis, 2000) would in such a framework be comparable to TV soap operas and could be discussed from the standpoint of how other media and commercials have an impact on socialization. Such a framework would also position the user of the game as a *consumer/observer*. Framing video games as toys, i.e., material for play, will make *The Sims* comparable to a dollhouse, for example, and place game studies in a long tradition of studies on play. In this framework, the user would be positioned as a *player*. Framing *The Sims* as a design tool will emphasize creative aspects and depict the user as an *author/ designer*. It is thus crucial to question how the academic community frames games. To use Wittgenstein's terminology (1953, § 65–71),we need to pay attention to what kind of "family resemblances" we ascribe to various games. Some frameworks will highlight specific features of games but hide or trivialize others.

For instance, the division of games into the categories *digital* and *non-digital games* makes us think in specific ways about games as a whole. For example, the literature about games, learning, and education can be seen as being divided into two traditions. Whereas the *International Simulation and Gaming Association* (ISAGA) has a long history of viewing gaming as an instructional approach that can be used with or without digital technology (e.g., Booth-Sweeney and Meadows, 1995; Thiagarajan, 2003), the more recent discussions about *serious games* and *gaming literacies* are associated with the field of educational technology (Gredler, 1996; Shaffer, 2007; Gee, 2003, 2005, 2007). Ideas about games and learning then become associated with ideas about using technology in schools, and the educational value of games is seen in relation to features like multimodality, visual realism, and interactivity. Other aspects, such as what it means to interact with *rules*, are then easily overlooked.

The distinction between digital and non-digital games is in many ways institutionalized. The multidisciplinary game research community,

Digital Games Research Association (DiGRA), for example, has this distinction built into its title. Yet the community as such embraces the study of any form of games, a fact implicit in its use of the term *non-digital games* for specific tracks in its conferences. While the distinction digital/non-digital, from a historical and technical perspective, certainly is useful, it can be argued that the recent trend toward pervasive digital technology makes framing the study of games and learning on the basis of the technology that is used seem dated. Is it relevant for the game experience if a game contains some form of digital technology? Consider, for instance, the toolkits for board games and tabletop role-playing games. These toolkits are in the form of applications for tablet computers or smartphones and are supposed to help players manage the complexity of some of the games. For example, the board game *Arkham Horror* (Lauinius and Wilson, 2005), a rather complex game with many cards in different categories and several submechanisms, has a toolkit that, among other things, replaces some of the drawing decks in the game. Might it not be that "digital" and "non-digital" are rather blunt instruments for discussing games? With pervasive digital technology around us, will it make sense to single out games on the basis of the technology they employ?

Instead, it might be fruitful to explore other forms of family resemblances among games that do not take into account the specific technology used in the games. Projects with an academic interest in game mechanics have approached games in this way. In the *Gameplay Design Pattern Project* (Björk and Holopainen, 2005a, 2005b; Holopainen and Björk, 2008), as well as the *Game Ontology Project* (Zagal et al., 2005; Zagal, 2008), game mechanics are discussed without excessive emphasis on the kind of technology employed in the games. The emergence of journals like *International Journal of Role-Playing* (http://journalofroleplaying.org/) also points toward classification of games that overrides the digital/non-digital distinction (see Hitchens and Drachen, 2008). In this article, I concur with these ways of approaching games.

Aim of This Article

The purpose of this article is to discuss the issue of digital versus non-digital games. I want to sketch a framework in which games are classified on the basis of their game-play rather than the material they employ. This means that such odd entities as sports, puzzle games, board games, and video games can be discussed with the same concepts. In order to do this, I outline how one can look at game-play from the perspective of ecological psychology (Gibson and Pick, 2000; Gibson, 1977, 1986; Reed, 1987, 1996). This discipline describes game-play in terms of perceiving and acting in accordance with affordances in games. This approach makes it possible to see new family resemblances among games, based on whether a game challenges the player's ability to *perceive* affordances or the player's ability to *use* affordances. The ecological approach to game-play thus takes a cross-section through attempts to classify games based on the kind of technology they employ.

Methodological considerations

This article is a strictly conceptual contribution, with no other empirical sources than the author's own game experience. It might seem a bit unusual to talk about *methodology* with such an approach. But it is true that the field of game studies has spent considerable time on the process of defining games and game-play (see for example Juul, 2003; Salen and Zimmerman, 2004). Mine is another account in this tradition of theoretical articles; and for this reason I would like to point out an epistemological concern of my own. I do not see the value of theory in its relation to an objective world of "things," but rather in how a theory can illuminate and describe something in a powerful way (Säljö, 2009, p. 204). The claims I make in this article rest on the ecological approach to perception, action, and learning, and should be read from this point of view. Whatever discussions there may be between ecological psychology and other approaches, for example cognitive psychology, this is not the place to pursue them.

AN ECOLOGICAL APPROACH TO GAME-PLAY

The Concept of Affordance

The theory of ecological psychology is mainly known from James Gibson's writings and the term and concept of *affordance* coined by him (1986, p. 127). The affordance concept was picked up by traditions such as *human-computer interaction* and *interaction design*, where it came to take on a somewhat different meaning from the original one (see Norman, 1998, 1999).

The main idea of *affordance*, as originally developed, is to address the reciprocal relation between humans and the environment (this applies also to animals other than humans; both humans and animals are regarded as perceiving and acting organisms in this theory). The environment contains everything, from buildings and plants to other objects, as well as other humans and animals. These things exist in relation to one another in a layout, a structure of the environment. This layout is constantly changing as events occur and things and people move, change, disappear, etc. At the same time, animals and humans are active organisms interacting with the environment. The environment *offers* the individual different ways of acting. These offers are called *affordances*, and an important part of the original formulation of the concept is that affordances are *relative* to an organism (relative between species as well as between individuals). For instance, a stone can afford being thrown for someone with a hand and arm of certain strength. This affordance is thus relative to the physical constitution, as well as the capabilities, of the organism. Many humans and some apes could use a stone as a projectile, but this affordance is *not* an affordance for an infant or for someone with a disability in the arms or hands.

An affordance is thus always relative to an agent; it is not an objective property of the environment. I find that the most illustrative meta-

phor for conveying the original meaning of affordance is that of an empty space between two fitting jigsaw pieces. The environment must have certain properties in relation to the acting organism, its bodily constitution, and its capabilities.

Although many basic affordances are of such a nature that they can be acted upon by a majority of the animals in a species, there remain individual differences. As Gibson and Pick (2000) point out, for humans, affordances are often an outcome of training. Experts in a certain domain have learned to utilize affordances that are not available to non-experts:

> Humans, at least, must learn to use affordances. Some affordances may be easily learned: others may require much exploration, practice, and time. . . . Further development of expertise may involve learning to realize affordances unavailable to non-experts. A three-inch-wide beam affords performing back flips for a gymnast, but the affordance is not realizable by others; rock climbers learn to use certain terrains for support that do not appear to others to provide a surface of support (2000, pp. 16–17).

Some affordances are thus only realizable (capable of being utilized) by experts in a domain, even if they are recognizable (capable of being seen) by others who lack the skill of acting upon them. I can see that waves on a windy day afford surfing, even if I cannot stand on a surfboard. It is important to notice, though, that being knowledgeable in a domain also means having the ability to perceive more affordances than a novice would. While I can see that the waves afford surfing, I cannot identify properties of the waves for doing certain tricks or judge whether the conditions are safe. Expertise is about both recognizing affordances *and* being able to realize them.

To Discover Affordances

In ecological psychology, the perceptual process is not about decoding messages that are sent to the senses and then enriched with some mental unit (such as schemata or mental models; see Gibson and Gibson, 1955). Our senses are instead seen as being in constant contact with information about the environment. For vision, this means that our eyes are in constant contact with the light that surrounds us. This light is structured in accordance with the layout of the environment (and the sources of light), creating what in this theory is called an "ambient optic array" (Gibson, 1986, pp. 65–92). When events take place in the environment, some things in the optic array change, while others do not. Over time, light is thus structured as having variant and invariant properties. Visual perception is about making distinctions in this flow of structural change that happens in the ambient optic array. This idea might seem abstract, and it is somewhat counterintuitive to think about perception without stimuli being enriched by anything. A parable might be informative here. When you are swimming in a pool or a lake and someone jumps in close to you, you can sense this fact on your skin even though that person has not touched you. What you feel is a structural change in the water; i.e., you differentiate between the sensation of calm water and that of water moving over your skin. So, just as we are immersed in water when swimming, we are, in everyday life, immersed in light.

The ecological approach rests on strong anti-cognitivist assumptions. It rejects the existence of mental schemata and the computer metaphor of an information-processing mind. Instead, a basic assumption of this theory is that learning and perception constitute a process of *differentiating* and making distinctions. It rejects the idea of perception as a process of *enriching*. We do not add mental schemata to stimuli in order to make sense of the world; we make sense of the world by becoming attuned to our environment, being able to make finer distinctions

(Gibson and Pick, 2000). The fundamental function of perception, then, is to pick up information about possible ways of acting in the environment. In other words, we look for affordances.

Just as we must learn to utilize some affordances, we also must learn to discover affordances by cultivating our perception. Experts in a given domain are able to perceive things in their surroundings that remain invisible to novices. A trained soccer player can see opportunities that someone who is not familiar with the rules of soccer would not see. For example, only a skilled player who is attuned to making the necessary distinctions can see the possibility of luring the opposing team into an offside trap. Acquiring the ability to discover specific affordances is called *perceptual learning* in the ecological approach (Gibson and Pick, 2000).

Perception and action

This theory presumes that perception and action are closely related as different functions of an ecological system. Here, perception is the process by which we perceive the environment, while action refers to our engagement with objects, events, places, animals, and other humans, as these are part of our environment. Yet some actions, like moving one's own body in order to see better or moving objects that are in the way of our visual field, are performed with the purpose of gaining information about the environment. We take actions in order to perceive what our world around us can afford, and we act upon these affordances, sometimes in ways such that new possibilities open up for us. Action is thus also the means by which we change things in the world; i.e., we not only interact with predetermined conditions, but are also capable of changing the conditions of our world (Gibson and Pick, 2000; Gibson, 1977, 1986; Reed, 1996). Another important point in this theory is the need to distinguish between two different aspects of actions. Actions have both exploratory/information-gathering aspects and performatory/executive aspects.

The *exploratory* aspect of actions is concerned with acquiring knowledge about the affordances of the specific situation. The *performatory* aspect of action is concerned with realizing affordances that have already been discovered (Gibson and Pick, 2000, p. 21).

> Perceiving and acting go on in a cycle, each leading to the other. Perception occurs over time and is active. Action participates in perception. Active adjustments in the sensory system are essential. But action itself may be informative, too. . . . Actions have consequences that turn up new information about the environment. . . . All actions have this property; but it is useful to distinguish *executive* action from action that is *information-gathering.* (Gibson, 1991, p. 601).

Thus, in a sense, action always reveals information about affordances; but it is useful to make some distinctions. As Gibson (above) points out, it is important to recognize that some actions are performed with the purpose of gathering information. As stated above, another important feature of action is that some actions *change* the affordances of a situation; i.e., we must consider affordances for changing affordances. For example, most adult humans are able to carry a ladder. To carry a ladder to a certain place is to use one affordance the ladder has for an adult, its property of being movable. The goal of the activity is not to carry the ladder as such, but to place the ladder in order to then climb it and reach a certain place. Thus, carrying is here an action taken to change the affordances of the environment, making a specific elevated place reachable. We use some affordances in a situation in order for other affordances to emerge. Thus, the environment can be said to have affordances for gaining other affordances. We not only adapt the environment; we also reveal information about affordances through action:

> Executive actions, such as reaching, grasping, and locomotion, have their own role in perceptual and cognitive devel-

> opment because they change the affordances of things and places[,] providing new occasions for information-gathering (Gibson, 1991, p. 601).

One way to gain new affordances in a situation is to use tools. By using a tool, some animals can extend their capabilities and realize new affordances (see Linderoth. 2010). Humans are superior to other species as tool users, and the whole history of technological development can be seen as a way of changing what the environment affords us.

Game-play and affordances

The ecological approach, as a general theory of perception, action, and learning, can be useful in the analysis of game-play. This theoretical framework offers concepts that can point us toward interesting discoveries. The affordance concept has already been used to discuss games and game-play (Linderoth, 2010; Linderoth and Bennerstedt, 2007; Rambusch, 2010; Gee, 2003, 2007). In this article, I join in this discussion and attempt to show that the difference between *discovering* affordances and *using* them can be a fruitful distinction to make as an approach to game-play.

Game-play and the exploratory aspect of action

As has been stated, actions have an information-gathering aspect, since they can reveal new affordances. Gibson and Pick (2001) point out that it is relevant to recognize actions whose goal is to discover affordances—what they label *exploratory* actions. Exploratory actions can be observed in numerous and varied instances of game-play. Consider the following examples.

A *pool* player walking around the pool table before making the shot, calculating angles, trying to predict how the balls will bounce, and so forth, can be described as taking exploratory actions. S/he is trying to find appropriate affordances in the situation.

A player of a third-person video game moving the in-game camera around when looking for enemies, power-ups, paths to take, etc., is taking exploratory action. A similar example would be a player of a side-scrolling game like *Little Big Planet* (Media Molecule, 2008) or some of the games in the *Lego* series, which moves the game character for the purpose of making the screen scroll and reveal new parts of the game world (see Linderoth, 2010, for an example of how side-scrolling in *Lego Indiana Jones 2* (Traveller's Tales, 2009) can be seen as an exploratory action).

A *soccer* or *hockey* player holding the ball or puck for a moment while looking over the playing field is searching for opportunities to make a pass.

A player of a board game like *chess*, who leans over the table, is trying to get an overview of the game state in order to find different opportunities for the next move.

A player of an adventure game like *Escape from Monkey Island* (LucasArts, 2000) who scrolls the mouse pointer over the screen in order to see if parts of the screen are highlighted, i.e., offer some form of interaction, is also taking exploratory action.

These are just some examples of game-play situations in which the player is active in finding information about affordances of the situation. In some fast-paced games like multiplayer shooters or tennis, it might be harder to observe specific actions as being *exploratory*. Yet, as Gibson and Pick (2001) point out, all actions have the prospect of revealing information about affordances even if they are not taken explicitly for this purpose. Moving in a multiplayer shooter in order to capture a flag or a spawn point will reveal obstacles on the way, and the player will discover affordances while moving. Expert gamers and professional athletes have learned to differentiate among all the

available information in a situation so that they perceive the affordances that are relevant in relation to the game they play and the specific game state.

Game-play and the performatory aspect of action

Some of the affordances that the player discovers during game-play will be acted upon. The player takes these performatory actions in order to achieve something in relation to the challenge that the game presents. Some actions will have a direct effect on winning or losing the game, achieving the personal goals that the player has set up. Shooting a puck or ball against a goal, attacking other players in multiplayer shooter games, jumping over some obstacle in a platform game, playing the highest card in a trick-taking card game, and so forth are all performatory actions taken directly against some goal. Many of the actions a player engages in during game-play have a *transformative* aspect, in that they can create new opportunities for other actions. The player can change things in a situation so that new affordances appear.The point here is that the player takes actions to *create* new affordances, not just to discover them through exploratory actions. Examples would be:

Positioning oneself on the soccer field or hockey rink in order to afford being able to receive a pass from another player. The constant movement of players in these games will present an ongoing flow of coming and going affordances, which the players try to control with their actions.

Taking cover and positioning the avatar in multiplayer shooters is also about changing what affordances the situation has for the acting player and the other players.

In a platform game like *Little Big Planet* (Media Module, 2008), crates can be moved in the game world; by placing them on certain spots, the

player can jump on them and reach new parts of the game environment.

In some board games, the units can be upgraded; for example, in *Shadows over Camelot* (Cathala and Laget, 2005), players can heal their units and get back health points by skipping a turn. In chess, moving a pawn to the opposite side of the game board upgrades that piece to a queen, a move that radically alters the affordances in the game.

In some video games, the dynamics of affordances change when a player changes avatars. In games from the *Lego* series *Lego Star Wars*, Lego Batman [Traveller's Tales, 2007, 2008], etc.), only certain characters can do certain things in the game environment. By changing his/her avatar, a player may find that new possibilities open up.

These are some examples of performatory actions that are said to have a transformative aspect because they change the affordances for the player.

An ecological approach to game-play

The theory of ecological psychology game-play can be described as follows. *To engage in game-play is to perceive, act on, and transform the affordances that are related to a game system or to other players in a game*. The player needs to handle a constant flow of opportunities for action as they come and go. Players perceive affordances through exploratory actions and act on affordances with performatory actions. The performatory actions that a player executes often transform the specific affordances the situation will contain. Two examples from the author's gaming experience can illustrate how game-play can be approached from the ecological perspective.

Example 1: Scrabble

During a typical game of *Scrabble* (Mosher Butts, 1938), I was looking at my letter tiles and also at the game board in order to find a good place to lay my tiles and form a word. I had just drawn some tricky

letters and had no vowels. While waiting for my turn, I discovered an opportunity to get at least two of my letters out and score approximately 20 points. Then, unfortunately, the player before me placed her word on the space I had planned to use for mine. So, instead of placing my letter tiles to make a word, I placed them back in the tile bag and drew some new ones.

Here, actively looking for available places to make words can be understood as exploratory actions. The game board and the letters I have available are the environment at hand. Trying to find a good move is the active search for affordances that will generate a high score. The performatory action of another player, placing tiles on the game board, transforms the available affordances, closing and opening up possible actions for me. The other player has altered the environment and thus changed what the situation affords. Throwing the tiles back into the bag and taking up new ones is a performatory action in which the player transforms her or his affordances in the game state; in other words, the new tiles in my hand are also an alteration of the environment.

Describing how we make decisions in a board game as a *perceptual process* might seem strange to a reader who is not familiar with ecological psychology: we easily think of this as a form of inner simulation, in which we imagine different scenarios. In the ecological approach, perception is an activity whose end goal is to discover new properties of the environment—something that cannot happen through imagination (Gibson, 1986, p. 257). Knowing is thus an extension of perception (Gibson, 1986, pp. 258–259).

Example 2: Trine

Trine (Frozenbyte, 2009) is a 2-D side-scrolling platform video game with both action and puzzles. The player's goal is, as in most games of this genre, to get from point A to point B in each of the game's levels. In single-player mode one can switch between three different charac-

ters: a knight, a thief, and a wizard. They all have different abilities. In one game-play session, I was playing as the thief and reached a chasm that I needed to cross. Examining the screen, I saw a small ledge on my side of the chasm. Jumping down to the ledge made the screen scroll down and reveal that at the bottom of the chasm there was just a floor, and not deadly lava or spikes, as there had been in other cases. Moving across this floor revealed a number of crates that I had to jump over. On the other side of the chasm there was a scarp so I could not get back to the surface. Since this scarp could not be climbed or jumped, I changed character to the wizard, whose special ability is to manipulate objects in the game world. I used the wizard to lift and stack the crates on top of each other so that they formed a rough flight of stairs, creating an opportunity to back to the surface. But before I was done, the wizard's magical energy became depleted and I could not finish. I started to move back into the chasm to look for other paths across it. Then the game made the sound of enemies appearing. I immediately changed to the warrior, who is the game's only character with close combat fighting ability. Some skeleton enemies charged my warrior, and I defeated them. One skeleton was shooting arrows at me from the top of the wall. I changed to the thief, who has a bow and arrow for ranged attacks, and defeated this skeleton as well. One skeleton had dropped a blue energy vial, which I picked up. Now my wizard had some energy again and could finish building the stairs. By jumping from crate to crate, I was able to back to the surface and continue along the level.

Scene from the game *Trine*.

We can describe and analyze this example using concepts from the ecological perspective. Moving down to the ledge was an information-gathering, exploratory action, taken in order to reveal what the bottom of the chasm afforded. Moving across the floor of the chasm was a performatory action, yet it revealed information about the existence of the crates and the wall. Changing to the wizard was a way of gaining the affordance to stack the crates, which was an action taken in order to gain the affordance of making the wall passable. Running out of energy was an event that transformed the affordances, so the wizard was no longer able to lift the crates. Moving back into the chasm had the purpose of finding information about other paths, i.e., other affordances for passing the chasm. Being perceptually attuned to the game meant that the sound of appearing enemies was enough information to make me perceive the affordance of threat and take the performatory action of changing to the warrior. Defeating the enemies and picking up the vial they dropped transformed the game state and the available affordances. The threat of being defeated had disappeared, and once again there was an affordance for building stairs.

These examples illustrate how game-play can be seen as a flow of affordances that come and go and that the player perceives, acts on, and transforms. It is a constant interplay of reciprocal exploratory and performatory aspects of action.

Can the Concept of Affordance Be Used in Relation to Socio-Cultural Learning?

It should be noted that Rambush and Susi (2008) have argued that James Gibson's theory cannot be applied to digital games in the way I suggest here. By making a bricolage of selected references from design and cognitive science, together with James Gibson's magnum opus *An Ecological Approach to Visual Perception* (1986), Rambush and Susi (2008) aim to set straight other researchers' misinterpretations of the concept of affordance.. Their main argument is that affordance falls

short of explaining interaction with digital games, since gaming requires socio-cultural learning in specific contexts. Features in a digital game cannot, according to these authors, be seen directly, since the activity presupposes that the gamer draws upon some form of cultural experience. Rambush and Susi invent the term *virtual affordances* for the information on the screen and make a sharp analytical separation between the real physical setting and the game. To talk about affordances in a digital game, as I do in this article, is, according to Rambush and Susi, a deviation from James Gibson's original concept.

It is somewhat ironic that their article is written with the intention of setting other researchers' interpretation of James Gibson's theory straight. Rambush and Susi's separation between biology and culture, as well as between virtual and "real," is exactly the kind of dualistic model that the theory was formulated to oppose. These claims are possible to make only because the authors disregard a fundamental aspect of the ecological approach, namely, that information about affordances is to be picked up in the *light* surrounding the actor/observer (Gibson, 1986, pp. 47–92). A screen is always part of the gamer's visual field (the ambient optic array), and so is everything around it. It is in this full field of information that we perceive affordances; in other words, "context" is always part of perceiving affordances. By simply looking at a car, one cannot extract the affordance of collision; it is when we have the perceptual information of a moving car approaching at high speed toward our point of observation that we recognize the affordance of an accident. Neither is it just from watching the screen that we see different affordances in a game: the edge of the screen, the sensation of sitting in a chair, the feeling of the keyboard against one's fingers, are all ecological information from which we extract very real affordances. James Gibson was clear that his theory includes both culture and learning:

> This [the altered environment] is not a new environment—an artificial environment distinct from the natural environ-

> ment—but the same old environment modified by man. It is a mistake to separate the natural from the artificial as if there were two environments. . . . It is also a mistake to separate the cultural environment from the natural environment, as if there were a world of mental products distinct from the world of material products (p. 130).

Picking up information, cultural or natural in origin, sometimes presupposes that we have become perceptually attuned to the information. "If the affordances of a thing are perceived correctly, we say that it looks like what it is. But we must, of course, learn to see what things really are" (p. 142).

The fallacy of Rambush and Susi's analysis lies in the fact that their argument is made like a quilt of disparate references that does not acknowledge James Gibson's legacy in the field of ecological psychology. In the later works about perceptual learning by James's wife, Eleanor Gibson, it is evident that affordance is a concept that covers the human socialization of cultural values as well as domain-specific knowledge (see Gibson and Pick, 2001, pp. 21–25). This was also evident, though not specifically addressed, in the original formulation of the theory. When James Gibson (1986) discussed the affordance concept in relation to gestalt psychology, he took the affordances of a letter-box as an example: "the real post box (the only one) affords letter-mailing to a letter-writing human in a community with a postal system" (p. 139). With this example in mind, it is really hard to argue that socio-cultural learning is not accounted for in in Gibson's original formulation. It thus makes perfect sense to claim that: the screen and the keyboard afford gaming to a game-playing human in a community with digital games.

CONCLUSION: EXPLORATORY AND PERFORMATORY CHALLENGES

The ecological approach is a theory of perception, action, and learning that has as its primary units of analysis the opportunities and constraints that the environment provides for humans and other animals. It makes a distinction between the capability of perceiving opportunities and the ability to use them. This distinction between the exploratory aspect and the performatory aspect of action opens up for us new ways of thinking about games. Games can be seen as challenging either the exploratory aspect of action or the performatory aspect of action. This is not a framework that makes a clearcut distinction between two separate categories of games; games can challenge both aspects, and in some cases it can be hard to see one aspect as being more challenging than the other. What I suggest is a framework in which the challenges in games can be seen as having an emphasis on either *perceiving suitable actions* or *performing suitable actions*. This is not to be understood as a simple physical-versus-intellectual dichotomy. Perception is, according to the ecological approach, embodied action.

It also is important to note that I here refer to the *designed challenges* in games. Just as any situation can present challenges to an agent, gameplay can be challenging in a number of ways that have nothing to do with the built-in challenge that the game designer aimed to present. For a disabled person, it is challenging to hold a controller, yet this is not the challenge that the designer wanted to present to the player. In some game groups, rules discussions and social climate can be utterly challenging, forcing the player to perceive and act on a number of affordances that the designer never intended (taking into account that other players will react in a certain way and we will moderate our own interaction in accordance with this). Yet this kind of social tension can, of course, also be designed into the system in games of negotiation. When talking about games as emphasizing either exploratory

or performatory challenges, one must do so in relation to the specific ways the system is designed to be challenging. Since interaction is organic and unpredictable, there will, of course, be situations in which the actual game session deviates more or less from the designer's intentions. The affordances of the game system and all other affordances available to people interacting with each other will merge. What counts as "following the rules" can thus be subject to local traditions, but in general the participant will see clearly which actions afford continuing the game and which actions afford the collapsing of the game session.

Exploratory Challenges

Games with an emphasis on *exploratory challenges* are described as: games in which the designed challenge is for the assumed player to know what actions to take, but executing these actions is expected to be more or less trivial.

Clear examples of games with an emphasis on *exploratory challenges* would be most board and card games like *chess* and *poker*. Under this category we can also place many digital simulation games and strategy games like *SimCity* (Maxis, 2000) and *Civilization* (Meier, 1991), as well as digital and non-digital puzzle games. In these games the challenge for the player lies in perceiving the rewarding affordances in a complex cluster of possibilities. The actions tied to these affordances, once they are perceived, are trivial for the player to execute. Drawing a card, rolling a die, clicking on something in a menu, placing a tile, and so forth are all actions that can hardly be seen as challenging.

Backseat gaming

Since the actual challenge in these games lies in perceiving affordances, not in the execution of them, there can be cases in which many persons share the position of player. Exploratory challenges can be shared, for instance, in puzzles and simulation games. While one player might

be in control of the mouse or control pad, or formally have a player position in a board game, these games allow other people to take part in the challenge even though they have no agency to execute actions in the game. This kind of *backseat gaming*—i.e., someone who formally is not a player in a game taking part in discovering affordances—can, of course, occur in games with an emphasis on performance as well. The point here is that when the challenge of a game is exploratory, persons next to the formal player can in fact have just as much, and in some cases even more, influence on the game. The whole issue of what I here call backseat gaming needs to be further explored. It might be a task for future research to investigate the pleasures of backseat gaming, as well as to what degree the person next to the player takes part in the game.

Performatory Challenges

Games with an emphasis on *performatory challenges* are descibed as: games that are designed so that knowing what actions to take is straightforward and obvious, but performing these actions is supposed to be challenging for the assumed player.

Examples of games with an emphasis on *performatory challenges* would include most sports. In track and field events like *pole vault, high jump,* and *hurdling,* the challenge is not to know what to do; it is to do it better than all the other competitors. The same goes for many video games in the multiplayer shooter genre such as *Counter-Strike* (Counter-Strike Team, 2000) or *Call of Duty* (Activision, 2007). The challenge lies in being good at using the affordances in different situations, so as to be faster and aim better than the opponents. Many other video games, such as racing and platform games, have the same property. The kind of board games that sometimes are called dexterity games will also be found in the family of games with an emphasis on performatory challenges. Games like *Jenga* (Scott, 2006), *Jackstraws,* and *Pitch Car* (du Poël, 1995) are challenging to the performatory aspects of action. *Table soccer, rod hockey*, *air hockey,* and *pinball games*

are also rather straightforward when it comes to perceiving what to do, but they challenge the player's performance.

It should be noted that games with performatory challenges also are demanding in terms of exploratory aspects of actions. A professional soccer or *Counter-Strike* player has a lot of expertise that has to do with perceiving affordances. Seeing and choosing affordances is not supposed to be an explicit challenge in these games, but something that adds to the player's skill. When we say that a soccer player is good at "reading the game," it is the soccer player's exploratory ability that is addressed. Yet, unlike the situation in a game with exploratory challenges, it is not enough to be able to see what would be a good move/action; a good game reader with no ball control would not be a competent soccer player. In many games with performatory challenges, the exploratory aspect of action is considered to be a separate domain. Sometimes this knowledge is connected with a person who is not in the actual game, yet is allowed to aid players with exploratory aspects of action, as a coach or a trainer. This is a crucial difference from games with exploratory challenges. While a chess or poker player might have a coach or trainer, it would probably be considered cheating if these players took advice from them in the middle of a game. In games with performatory challenges, it is not a problem if a coach shouts out advice to the players in the middle of the game.

Another important thing to note here is that actions are deemed trivial or challenging for an *assumed player*. By this I mean that some disabilities can make actions like holding cards or rolling dice a challenge, yet this is not the challenge that the designer of the game had in mind. Most board games are designed for someone without disabilities. It is important to keep in mind that affordances are always a relation between the capabilities of an agent and her or his immediate environment (Gibson, 1986). In the Paralympics and Special Olympics, one can find many games that illustrate the importance of always having

an assumed player in mind before stating what is challenging or not in a game.

DISCUSSION: BEYOND THE DIGITAL DIVIDE

The main idea in this article has been to describe game-play as the process of seeing, using, and transforming affordances: a way of explaining game-play that entails an understanding of challenges in games as being either about perceiving and choosing affordances or about using affordances.

This framework can be used to highlight many different issues in the field of game studies. It opens up discussions about the relation between game studies and sport studies. It shows how certain board games, so-called dexterity board games, have a different structure from that of more traditional board games. It provides concepts for discussing differences and similarities among *game room/recreation room games* like air hockey, pinball, and arcade games. These are all matters that can be fruitful to explore in the future. The focus here has been on how the ecological approach to game-play overrules classifications of games that are based on the kind of technology the games employ.

As I have stated, the aim of this article is not to get rid of the distinction between digital and non-digital games. This division certainly is useful from a historical and technical perspective. But in our attempts to understand game-play and the ways in which people interact with a game, it might be misleading to ascribe a special status to digital games.

The skeptic might object and point out that most digital games are virtual because they take place on a screen, and that this is a crucial difference from games taking place in the real world. From an ecological approach, there is no ontological difference between the information obtained from a screen and that obtained from the so-called real world. Information about affordances can be found in the perceptual

field and discovered by someone even if the source of information is on a screen (Linderoth and Bennerstedt, 2007). Most video games are controlled with some kind of tool, like a mouse or control pad, that extends the player's agency into the realm of the game. But this kind of extension of agency "into" a game's realm cannot be seen as an outcome of digital technology. Consider, for instance, pinball games and claw machines, where the player uses control mechanisms in order to have agency in the "realm" of the game. This kind of extended agency, using tools for performatory actions, is certainly worth studying, but seeing it as something unique for "digital" technology might be misleading.

The skeptic might also point out that digital games restrain possible actions to the legal moves in a game (see Juul's 2003 critique of Bernard Suit's game definition). Still, this does not mean that everything that is *possible* in a digital game is allowed by the rules. Consider for instance the phenomenon of spawn killing in multiplayer shooter games or the case of using hacks, exploits, and cheating.
The recent development of pervasive digital technology and ubiquitous computing also challenges our understanding of what it means to interact with computers. Smartphones and tablet computers have already become everyday technology, and the field of pervasive games is expanding (Montola, Stenros, and Waern, 2009). It seems fair to assume that labeling a game as "digital" some years from now might seem just as outdated as labeling *light* as being "electrical", *sound* as being in "stereo," or *pictures* as being in "Technicolor." In order to be prepared for such a change, it might be important for the field of *game studies* as well as for organizations like DiGRA to look into their reliance on the dichotomy of digital versus non-digital games.

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