The GEM Game Experience Model

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Abstract For over a decade now game research has aimed at describing the game experience by attempting to see it from one perspective. In this paper, we collect, analyse, and merge together this work. As a result, we claim that a game experience is composed of three pairs of elements, none of which can be removed, or the system in question is no longer a game. These elements are: (1) the game mechanics and action, (2) storyworld and narrative, and (3) aesthetics and sensory stimulus. This model can be illustrated in the form of a gem that encloses the fantasy and immersion of a game. Apart from games, this model is applicable to all kinds of storytelling, particularly interactive kinds. Beyond games, the different facets of the gem can be used by ignoring elements absent in the given narrative media.

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1 Introduction

When Hunicke et al. (2004) introduced their MDA (Mechanics, Dynamics and Aesthetics) framework to help the game industry to design “desired experiential results of gameplay”, they playfully noted that “there is no Grand Unified Theory of games”. This has not prevented many authors from forming their own, all-encompassing models for analysing games. These include game experience theories and frameworks such as Smed and Hakonen (2003), Björk and Holopainen (2004), the MDA model of Hunicke et al. (2004), the SCI model of Ermi and Mäyrä (2005), and the game immersion model of Adams (2013).

Following the principles of Straussian Grounded Theory (Niekerk and Roode, 2009), we have already in our earlier work (Mäntylä et al., 2014) analysed and compared these models and presented an initial fusion of these highly similar models, and in this chapter, we continue this work and present a new fusion model called the *Game Experience Model* (GEM).

This work was originally inspired by the observation how Adams seems to agree with Ermi and Mäyrä about the existence of narrative immersion, and another one, which Adams calls “tactical” immersion and Ermi and Mäyrä “challenge-based” immersion, whereas the third channel of immersion Adams mentions is “strategic” immersion but Ermi and Mäyrä lists “sensory” immersion. Both models seem to make sense in their own right, and they have a significant replication, as a good scientific theory should have, despite that there seems to be a gap between them. These two models were our initial pair of data for our Grounded Theory work.

The GEM is intended to be a tool for both analysing and designing games. It should help one to feel confident that no part of the game experience is neglected in the design process. The GEM attempts to be the guide to the anatomy of the gameplay experience, helping the designers to pay attention to the equivalent ergonomics – making sure that the game is properly designed to suit the intended audience. As a fusion of several frameworks, the GEM functions as an interpreter between different models. When investigating the design ideas from researchers focusing on a different framework behind their thinking, this chapter in particular should help in using the GEM as a tool to translate the ideas from one framework to another.

In this chapter, we present first the outcome of our analysis as a fused theoretical game experience model in Sect. 2, followed by a more-detailed analysis in Sect. 3. In Sect. 4, we compare the GEM with the earlier models presented in the literature. This is followed in Sect. 5 by some example analyses of games that demonstrate how games can be dissected using the GEM. Finally, the concluding remarks appear in Sect. 6.

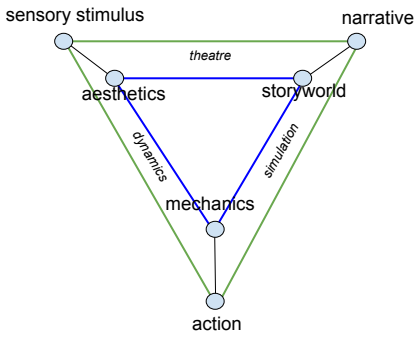

Fig. 1 The structure of the GEM as a flattened triangular cylinder.

2 The structure of the GEM

The GEM recognizes six elements of a game experience and the relationships between them. Figure 1 illustrates the GEM as a triangular cylinder (or a prism) with six vertices and five faces. The vertices form three pairs:

- *Mechanics – Action*: Mechanics include all the actions that can occur in the game and all the game objects – everything defined by the rules of the game. Action is how the mechanism functions in each situation.
- *Aesthetics – Sensory stimulus*: Aesthetics include all the sensory and cognitive designs aimed to evoke emotions in the player. Aesthetics presented to the player is called sensory stimulus.
- *Storyworld – Narrative*: Storyworld provides the substantial content for games. It includes all the events and things in the game universe, both the ones that become actualized during the gameplay, as well as the ones that do not, or even could not, because they were not put in the game, only imagined by the game designers, or through becoming logically necessary, or likely, due to circumstances that are included. Narratives are the pieces of the story from the storyworld that occur during game play.

The three side-faces of the cylinder are labelled *Dynamics*, *Theatre* and *Simulation* (see also Fig. 2). The upper face, *Designed Fantasy*, involves the elements of Mechanism, Aesthetics and Storyworld. These higher-level elements are expressed by the game through the elements of Action, Sensory stimulus and Narrative residing at the lower face, *Experienced Fantasy*.

The game experience can be viewed from each of the five faces. The player experiences the game through their own personal narratives experienced during the game, as well as the actions they have taken and the sensory stimulus they have received. They can perceive the greater whole through the *Experienced Fantasy* face, but it is the primary interface they have.

Game designers perceive the game through the opposite *Designed Fantasy* face, constructing the whole fantasy of the game, fitting the storyworld, game mechanics and aesthetics together, which all form the greater idea behind what is concretely

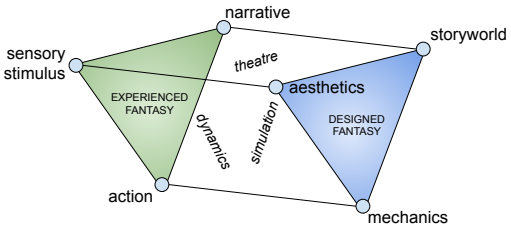

Fig. 2 The structure of the GEM as a prism.

given to the player to experience. The game designers are likely to expect that their designed fantasy would match the experienced fantasy as closely as possible (see Fig. 3).

There is an interesting phenomenon, where the game designers perceive that the whole of the created game is located within the GEM as a certain shaped bubble at a certain location, but the player community actually appear to perceive a different bubble at another location. In particular, open world games can be seen in many different ways. A player can ignore the main story and go exploring the realm of *Skyrim* (Bethesda Game Studios, 2011), focus on taming all the different animals in *Far Cry Primal* (Ubisoft Montreal, 2016), or just drive around with the cars in *Grand Theft Auto V* (Rockstar North, 2013).

We can look at a game through the *dynamics* face between aesthetics, stimulus, mechanics and action. This face ignores the story and motivation of the game, observing it merely as a spectacle akin to a sports performance. This face is essential for games such as chess, where there is no real story or the story comes from outside of the game such as in *Ingress* (Niantic, 2013). The whole elegance of the game aesthetics and player actions can be seen through this face, which is traditionally the case in several sports such as figure skating, and ski jumping.

Looking at a game through the *theatre* face between aesthetics, stimulus, storyworld and narratives, the rules of the game disappear, and what remains is a sequence of events, as in a movie. This is a face essential for entertainment applications, where there are few, if any player controls. As the element that provides participation, the

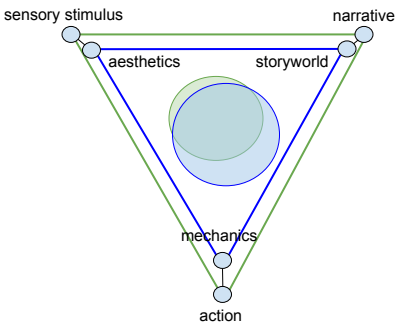

Fig. 3 The actualized Designed Fantasy and actualized Experienced Fantasy within the GEM typically have an offset, and the players may form a greater or smaller fantasy than the designers intended. Also, the full potential fantasy of the game is a larger space than neither the designers nor the players will ever explore.

mechanics are, what essentially separates games (including all forms of interactive storytelling) a part of other forms of art.

The final *simulation* face is the one between mechanics, action, storyworld and narratives, where actions and their causalities are clear, but their representation is ignored. This is equivalent to low-level simulations, or text-only adventures. The simulation face perceives only the pure gameness of the experience, ignoring the aesthetics. The challenges of the game arise mainly from the mechanics and narratives that explain what the players are supposed to be doing in the game. The same essential action can be represented in several different ways, using visuals, audio, and other sensory stimulus.

These six elements are the components that form a game. They are distinct from other relevant elements involved in the gameplay as they are built in the game and invariably the same anytime and anywhere the game is played, or else it is a different game. Social interaction, for example, is a context, where the game is being played. The game mechanics may support social interaction, but the social interaction varies based on the society where the game is played.

3 Looking deeper into the GEM

The idea of "core fantasy" as the centre of what a game is can best be explained through a failure to sell such a fantasy. Paul Kilduff-Taylor talks about the conceptual failure of their game *Frozen Cortex* (Mode 7 Games, 2015) during the GDC 2016 'Failure workshop' (GDC Vault, 2016). In the preceeding game, *Frozen Synapse* (Mode 7 Games, 2011), the player's and their opponent's turns play out simultaneously, but each player (or computer opponent) is able to plan out their actions beforehand. *Frozen Cortex* plays much in the same fashion, but the core difference is that while *Frozen Synapse* is a game where soldiers kill each other, *Frozen Cortex* is a game of future-sports, where robots compete to bring a ball over to the end zone and score a touchdown. Unfortunately, the game was not as successful, which Kilduff-Taylor called a "conceptual failure" brought on by the failure to sell their audience on a proper core fantasy. He reflects:

> Thinking back to all the games that I really, really liked, and what we've done with *Frozen Endzone*, we had this problem where there wasn't a kind of core fantasy at the heart of it, nobody really wanted to be sort of managing a futuristic sports' team with tactical stuff. Nobody really wanted to do that. While being a space pilot, doing all the other things you can do in other types of games, they're fantasies that people have, they're things that people like.

The core fantasy of a game, as defined by him, could be summed up in a series of questions: "What are you doing in the game, what do people want to do, what's exciting about the idea?". Everything else, then, builds up from this core fantasy: the aesthetics of a game is how you convey it to the player, sound and music design likewise, as are the various mechanics of the game. It is important to note that in our definition, fantasy is distinct from 'story' or 'narrative', although they are

generally central to the ability to sell the fantasy of a game (much like the aesthetics of the game overall, and the actual mechanics once you are playing it). It is also important to remember that fantasy is by its very definition individual: it exists within the player's mind, not as something external or objective. And finally, a single game can cater to many different fantasies, and it may well be that the core fantasy *intended* by a game differs from the experienced fantasy of the player. For example, *X-COM* Firaxis Games (2012) might appeal because it is a game where you get to be a master tactician, always a few steps ahead of your opponent, winning against impossible odds because of your superior brawn. Or the appeal might come from the player's position as an underdog, winning desperate, pyrrhic victories in a fight they are destined to lose. Or then it might be appealing because of the personal stories of the player's squad members, their failures and successes and their growth from pathetic rookie to unstoppable alien-killing machine. These individual fantasies are then facilitated by various gameplay mechanics and aesthetic choices; one of the most important being how your squad members gain ranks and skills and can be individually named and their appearance customized.

Good game design accepts that what needs to be captured is the player's imagination, and what needs to be catered to is the target audience's fantasies. That is why *Frozen Cortex* failed, because the core audience of strategy games was not interested in embodying the manager of future-sports robots. Kilduff-Taylor points out that all the other aspects; visuals, mechanics, audio and so on, were improved on or remained the same. The failure came solely from a failure to engage in a proper fantasy. Jesse Schell (2008) would probably call this the ‘experience’, that elusive thing that all game design strives for, yet which is not the game itself; “Game designers only care about what seems to exist. The player and the game are real. The experience is imaginary – but game designers are judged by the quality of this imaginary thing because it is the reason people play games.” Schell (2008, p. 11).

Narrative remains important to the notion of fantasy, but not in the traditional sense of narration from game-to-player; rather, if fantasy is an intangible thing happening in the mind of the player, then *their narration of their experiences* constitutes the tangible, existing expression of their fantasy. How well a player is able to narrate their own experiences is a good marker of how well a game has managed to tap into some particular fantasy.

Although we state, especially in Fig. 3, that aesthetics, storyworld and mechanics are foremostly what concerns the game designers, and that sensory stimulus, narratives and action are what the player foremostly experiences, this must not be seen so that the first triplet would not affect the play experience, nor vice versa. The narratives are a representation of the storyworld, and the making of the GEM consists of how well the storyworld is conveyed to the player. This applies as well to the sensory stimulus representing and conveying the aesthetics, and the action representing and conveying the mechanics.

Fantasy differs from agency, where agency requires a sense of power to influence the narrative, whereas fantasy only requires the immersion into the narrative. Immersion can improve, if the player can influence the narrative. Agency can improve the fantasy, but fantasy can exist without agency. Fantasy is more active than suspension

of disbelief. Suspension of disbelief mainly relies on the mechanics and narrative playing together, so that the player can accept the mechanics behind the narrative. However, suspension of disbelief only requires the player to believe, what is taking place, whereas fantasy involves also the aesthetics. The player needs to enjoy the feelings that the gameplay provides.

3.1 Mechanics and action

Sicart (2008) defines game mechanics as "methods invoked by agents, designed for interaction with the game state" following the view of Hunicke et al. (2004) which states that mechanics "describes the particular component of the game, at the level of data representation and algorithms". Adams (2014, pp. 352–353) breaks this down and lists five major types of game mechanics:

- physics (e.g., Newtonian mechanics or cartoon physics)
- internal economies (i.e., rules governing creation, consumption and exchange of quantifiable resources)
- progression mechanisms (i.e, progress through a series of challenges)
- tactical manoeuvring (e.g., taking place in largely open or semi-open spaces)
- social interaction (i.e., rules that control the relationships among players)

Game mechanics make the gameplay possible and drive it forward. These progression mechanisms can be divided into two categories (Juul, 2005, pp. 72–82): games of emergence and games of progression. In *games of emergence*, the flow of events emerges from the operation of the rules, and the events are not pre-planned by the game designer. For example, chess, bridge and *Tetris* (Pajitnov, 1984) rely on emergence to make the gameplay interesting but there is no premeditated sequence through which the events unfold. In *games of progression*, a predefined system causes the player to experience the game in such a way that certain events are certain to follow other events. This progress can happen through space (e.g., enforced by level design), time (e.g., events are triggered in predefined time intervals) or a story (e.g., the player progresses through a narrative that triggers events and gets triggered by player-initiated events).

Mechanics include the rules of the game, which forms an essential aspect as Huizinga (1955, p. 11) observes: "All play has its rules. They determine what 'holds' in the temporary world circumscribed by play. The rules of a game are absolutely binding and allow no doubt." A significant subset of the rules is the "set of actions that the system can logically process" as an input from the player (Szilas, 2004). The mapping between this set of logical actions and the set of physical actions enabled by the user interface, is the essence of the connection between mechanics and action. Moreover, mechanics and action involve the participatory affordance (Murray, 2012) in games, making the opposite face of the GEM involve mostly non-interactive forms of storytelling, and not actual games. One could say that "traditional art" such as movies lack interaction and mechanics completely. Nevertheless, even they have an

agreement, in the sense of Adams (2013), between the audience and the storyteller commonly known as “suspension of disbelief”. The audience must be able to relate to the story and the characters, and this is where a glimmer of mechanics shines through the GEM even in these mediums. The reality of the narratives must make sense to the audience – this reality of the story belongs to the mechanics element of the GEM.

The action-based immersion modality is connected to the strategic one. It remains quite hidden in turn-based games (e.g., chess) where it mostly manifests in the player’s skill to plan ahead several moves or estimate the probabilities of consequences. In fast paced games, action-based immersion modality manifests more clearly in reaction speed, accuracy, and even strength.

A game can have different gameplay modes, for example, driving mode and conversation mode. In the driving mode, the player’s action of pressing the controller key X could mean accelerating, but in the conversation mode, the same key X could mean choosing a dialogue item from a menu. The same action in different modes would thereby be mapped to different a game mechanic.

Action is not equivalent to the rules of the game, as a bad interface design may prevent the player from taking an action that would be valid according to the rules/mechanics. The action element also includes technical problems such as the inaccuracy of the GPS in a location-based game (Benford et al., 2006; Jacob and Coelho, 2011) or an adware-game advertisements disrupting the gameplay (Lewis and Porter, 2010). In the latter example, the player may try to click on an icon to close the advertisement but the advertisement either closes just before the player clicks or it does not catch the players’s click rather than letting it pass through to the game. In either way, the action becomes an unintended click on the gameplay.

Today a typical game is controlled by a standard game console controller, where the buttons and joysticks are assigned differently for each game (Blomberg, 2018). There does exist certain conventions followed by a majority of games. These are equivalent to the standard of an aircraft nose lifting, when a joystick is pulled back (essentially downwards) and diving in the opposite direction. However, these conventions are not always followed, and sometimes even within a single game, a certain action can be done with different button in different situations. An example of the latter is how firing a weapon in *No Man’s Sky* (Hello Games, 2016) is performed with one button when controlling a vehicle and with another button when the game character is on foot. Achieving immersion is affected by the need to adapt to a new control layout, especially if the layout alters during the game.

A significant difference between action and mechanics is that action refers to the concrete application of mechanics. In puzzle games, the puzzles as such are a part of the mechanics element as is their fundamental solving, but the application of the game controls to perform the operations required for the solution are part of the action element.

When a game mechanism is off balance, it is a design failure. When a player is unable to execute a valid action, it is an implementation failure. Design failures are observable through the design facet of the GEM and implementation failures through the experience facet. An example of this can be seen in David Newton’s

reviews of the game *Prince of Persia* (Mechner, 1989) in a great variety of different platforms. As a matter of mechanics, (Newton, 2014, 7:20–7:27) describes, how the Nintendo Entertainment System (NES) version of the game uses scrolling of the screen because the whole scene does not fit the screen simultaneously, unlike in most other versions. Also, the mechanism of switching places with an opponent during a fight has been removed as a game mechanism in this version (Newton, 2014, 8:08–8:13). Newton (2014, 6:20) states in his review: "The mechanics of the game are nice and precise", where GEM would rather recommend the word action instead of mechanics, as he is speaking of how the player experiences the swiftness of their control affecting the character in the game.

3.2 Storyworld and narratives

Essentially, the storyworld is typically an infinite universe, envisioned by the game designers. The narratives are the pieces of storyworld that the player experiences in the game. They have made aesthetic representations of part of this universe, in the form of plots, text descriptions, action scenes, sounds, art and other, which are presented to the player as a narrative within the storyworld during game play. The player also typically generates their own narrative through induction. Particularly in games with a lot of simulation, but little dialogue, such as *RimWorld* (Ludeon Studios, 2018) or *SimCity* (Maxis, 1989), the player projects emotions to the events and creates narratives that the game designers have not really prepared in the game.

The storyworld is very much in the interaction with the aesthetics. Here, the narrative is the parts of the story that actually takes place in the instance of playing the game – what is told by the game to the player, and which narrative the player is choosing themselves. Through one or more travelsars through the game, the player constructs in their mind a storyworld of the game – what happens outside the narrative, or what could have happened instead. What is the moral of the story. What is actually written as a narrative in the game by the game designers is often only a part of the whole game storyworld that the game designers have designed. The storyworld is to the narratives as the mechanics are to actions: The game may involve the rule of jumping over a pit, but the player may avoid all areas with a pit, and therefore the action of jumping over a pit never exists in a game, although it exists in the game as a mechanism.

If games exist to sell a fantasy, that fantasy is very often a power fantasy: the common wisdom is that players want to feel empowered and in control, able to exert their will on the game world in various ways (often violent, but not necessarily). Even a game like *Hellblade: Senua's Sacrifice* (Ninja Theory, 2017), where you play as a woman suffering from a debilitating psychosis that is threatening to entirely eat her up, the player, in their moment-to-moment interactions with the game, is nonetheless living a power fantasy. The roots of power fantasy can be seen already in Huizinga (1955, p. 10): "Here we come across another, very positive feature of play: it creates order, *is* order. Into an imperfect world and into the confusion of life it

brings a temporary, a limited perfection.” The nature of play allows us to exert power on reality. We can become, like in *Hellblade*, a skillful fighter that we in reality are not, and would have to struggle much to become, both in physical training and in issues of social acceptance. Games and play allow us to simulate things, and we are in control of the simulation – what is difficult and what is easy. “Play begins, and then at a certain moment it is ‘over’.”

Narrative can affect the game mechanics, but is not necessarily restricted to them. Narratives are used especially to transit the player between different sets of mechanics. In a game the player may first have their character walk on foot with the related mechanics and actions available to them, and then there is the narrative of entering the car, upon which the player is transferred to the mechanics and actions of driving a vehicle. However, also in games of war, for example, the move of attacking another unit also has its own narrative, even though it is just an application of the game rules.

Cognitively, a narrative plot is a significant part of the aesthetics. A well designed, solid yet exciting narrative plot evokes emotions in the players. The line between narratives and aesthetics is surprisingly perhaps the most vague in GEM. It is clear to see that distinct sensory stimuli are not the same as the narrative.

3.3 Aesthetics and sensory stimulus

As Niedenthal (2009) notes, the study of games tend not to be familiar with the whole brevity of what is meant by aesthetics. Aesthetics is not only about “eye candy” – about being pretty and shiny. Aesthetics could be easiest to understand by considering its antonym which is most familiar to us from the field of medicine: anesthetics – numbness, lack of senses and emotions. As the reverse of this, aesthetics is the whole field of emotions and cognitions experienced by the player during the gameplay. From an epistemological viewpoint, aesthetics studies the judgment of sentiment flowing from sensory inputs. Not just from a ludic player perspective, but also how game designers imagine and create virtual worlds. If a game designer fails in their quest for a synchronised (between themself and the player) aesthetic, they are likely to numb the player to the game’s designed experience (or fantasy, in the case of the GEM) of overcoming interactable challenges. When this occurs, there tends to be a blurring of active participation in favour of spectating a narrative (watching a movie with you as player in it), making the aesthetic experience of player and spectator indistinguishable. If done right, aesthetics becomes the most direct channel for a game to present itself to the fantasy of the player.

Presenting a game as a truly pleasing aesthetic experience is less forgiving, than say, a painting. Games are digital systems where audio, visual and haptic (three out of the five classical senses are available) output is available to the designer with the further complication of the player’s goal-oriented desire to win. How to create a visual scene that represents game states in a way that is pleasing and not boring, repetitive or clumsy, becomes a precarious balancing act.

Murray (2012) states that "any medium serve three nested processes: inscription, transmission, and representation." This structure can be found in the GEM. Sensory stimulus is equivalent to inscription. It is the immediate sensory interaction between the game user interface and the player, such as the sounds and visuals presented by a game console, or the game pieces of a board game. From a GEM perspective, mechanics and storyworld are the catalyst for representation, in that these form the bi-focal lens on the gameworld the designer provides the player. Together, this lens and the inscribed sensory stimuli, transmit aesthetics.

Aesthetics intrudes into storyworld and mechanics. A great storyworld is coherent and suitably rich, but at its most dull, it reduces to a flowchart. Aesthetics arise from the tensions in the story, and how the story is presented to the player. For instance, a horror story typically has different visuals and music styles than a comedy.

The challenge for the storyworld is to generate a great story. Although there is an essential fascination in amassing points or beating time limits, a digital game can benefit greatly from a great story connected to these play-drivers through fluent representation, with all the moves between the start and the end of the game as part of the story. As Niedenthal (2009) notes, the concept of aesthetic does not only include the sum of the player's sensory input, but also the emotions and the state of mind caused by the experience.

Aesthetics is something that can be objectively put and found in the design. The evoked emotions are all subjective. This, of course, partially includes the action and narrative, but the most direct influence lies with the sensory stimuli from the game interface devices. The graphics, music, sound effects, haptic output, and other possible sensory stimulus mechanics convey to the player the results of their own actions, the narrative of the game, and hopefully the cognitive, aesthetic experience intended by the game designers. Aesthetics and sensory stimuli provide the representation for the other elements.

4 Comparing the GEM with other models

In this section, we compare five earlier models to the GEM. Our intention is to clarify how they relate to the GEM and point out the limitations of these models.

4.1 Smed and Hakonen

Smed and Hakonen (2003, 2017) define that the anatomy of a game is as illustrated in Fig. 4. The model includes five subjects: players, rules, goals, opponents and representations, and seven relationships between them, forming three aspects of a game. Here we relate these subjects and relationships with the elements and faces of the GEM model. This analysis is also presented in Table 1.

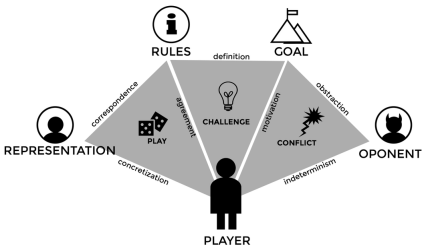

Fig. 4 The anatomy of games as perceived by Smed and Hakonen.

Table 1 A comparison of the model by Smed and Hakonen to the GEM.

Smed and Hakonen	GEM	Comment
representations	sensory stimulus, action	The sensory stimulus and player action are the concretizations that “represent the abstractions used in the rules.”
rules	mechanics	Direct equivalence
goal	mechanics, narrative	“Goals give arise to conflicts and rivalry among the players.” GEM perceives this in the enabling mechanics and motivating narratives.
opponent	mechanics, narrative	The opposing unpredictability is either included in the mechanics, or delivered through the narrative.
player	—	The game experience occurs, when a player interacts with a game. The GEM is the anatomy of this experience.
definition	mechanics	Within the mechanics, the rules define the goals. The narrative can easily get involved here and interfere with the rules.
agreement	action	“[The players] agree to follow the rules.” The action is, how the player executes their part of the mechanics and their agency.
motivation	mechanics, narrative	Motivation is essentially the same as goals.
correspondence	mechanics, sensory stimulus	Both models agree that the sensory stimulus/representation must correspond with the mechanics/rules
concretization	sensory stimulus, action	Smed and Hakonen perceive that the “representation concretizes the game to the players.” In GEM the concretization occurs through the action and sensory stimulus.
obstruction	narrative, action	As the player is more obscure in GEM than in Smed and Hakonen, the obstruction comes through, either the narrative of the fictional NPC opponent, or the action of the player opponent.
indeterminism	narrative, mechanics	Indeterminism in GEM is due either the narrative (which does not have to be constrained by the mechanics) or due to the rule in the mechanics, where a die can be rolled, or another player may take alternative actions.
play	dynamics face	Abstract rules correspond to real-world objects, and the game is concretized to the players.
challenge	simulation face	The story explains the reasons for the challenge posed by the initial setting, eventual goals and the rules/mechanics in between.
conflict	theatre face	The narrative of the opponent (and the player) creates an exciting conflict.

Smed and Hakonen found their model on the player as an element in the design. The GEM does not see the player as an element of design, but rather the design exists between the players and the game designers. The player perceives the game mostly through the player face of the GEM, interfaced through the player’s actions, stimulus and experienced narratives in the game.

Rules are the direct equivalent of the GEM mechanics. Goals, as components that “give arise to conflicts and rivalry among the players” should be divisible between goals included in the mechanics as victory conditions, or in the narratives as story

motivated goals. Even, when described by the narrative, the goals are, indeed, defined by the game mechanics.

Motivation is a complicated term. Essentially, the game experience as a whole is what motivates the player to play the game. In Smed and Hakonen's model, the motivation refers more to the motivations that the player has for their actions within the game, which differs from the concept of goals only in nuances and in perspective. Goals are pulling the players towards themselves, whereas their produced motivations can be seen as pushing forces. Motivations are internal feelings in the players, whereas goals are external targets for these feelings. Looking through GEM, one should see that the players are motivated to play by the elements of the storyworld and the aesthetics of the game, but in some cases also an interesting game mechanics can motivate game play. In the game, the players agree to comply with the game mechanics, as well as creating narratives jointly with the game.

As challenge comprises of the player attaining the goals in accordance to rules, it would be equivalent to the "simulation" face of GEM. This is compatible, considering that the challenge as such does not involve aesthetics directly. The challenge can connect to aesthetics through the narrative that sets the goals for the challenge, or the actions the player needs to take to achieve the goals.

The hidden opponent that obstructs the player, can also be a part of the game mechanics as a random factor. Some people have a dislike to chess, for example, as the game does not provide enough random factors in the game mechanics, but the opposition comes all from the other player directly. Most often, as in the case of chess, the opponent is part of the narrative – the actions taken by the characters in the game world. A good opponent brings indeterminism to the game and obstructs the player from achieving their goals. The conflict of the game in GEM can be seen through the theatre face, created together with the narratives of the game setting, and emotions evoked by the aesthetics of the form of the narrative – good vs. evil, and the excitement of all of the schemes on both sides.

The game activity is represented for the player through sensory stimulus, and basically also through the player's actions. The sensory stimulus concretizes the game mechanics and thereby needs to correspond with them.

The play activity that is connected to the representation takes place in the dynamics face, where the narrative is only at the background, motivating the play. This is the concrete part of the play – what really happens when the game is played. The GEM model also recognizes the Huizingian child play, as seen from the theatre face, where the exact rules and mechanics are not so important, and a conceptual play, seen from the simulation face, where the aesthetic representation is not so important.

4.2 Björk and Holopainen

Björk and Holopainen (2004) focus more on the design of how a game is played than how it is built. They state that their aim is not "to formulate a definition of what game or play is", as there are several existing already. They aim at describing

patterns of different observable phenomena observed during activity that people are calling game play.

Björk and Holopainen divide their discovered components into four categories: holistic, boundary, temporal and structural. The holistic quarter, in particular, investigates the contexts of the game play, rather than the game itself. The GEM excludes this part, as it is something that is not built within the game. If a game was sent in a time capsule five hundred years in the future, the players' contexts would likely be quite different, but the GEM elements would follow with the game. The GEM-elements of the *Iliad* are still the same, even though the audience experience certainly is different, due to the changes in the context.

Foremostly, Björk and Holopainen describe a library of design patterns for games. In addition to the patterns printed in the book, it comes with a CD that contains even more patterns. The concept of design patterns has been adopted from the field of traditional architecture, through the method of Gamma et al. (1995) who implemented design patterns in software architecture as a part of the agile movement in the 1990s.

When it comes to game play experience patterns that Björk and Holopainen (2004, p. 206) describe, the closest that come, are the *immersion patterns*: spatial immersion, emotional immersion, cognitive immersion and sensory-motoric immersion. Not surprisingly, these four names sound similar to what we have in the GEM.

- Spatial immersion: “the result of extensive Maneuvering in the Game World in Real-Time Games and can sometimes be felt in movies.” This is the “being there” type of immersion, where the player is presented the game world as a place where they are, and the player can experience the sensations of being there. In the GEM, this falls under aesthetics, where the player is emulated with fictitious sensory experiences of the game world.
- Emotional immersion: “obtained by responding to the events that Characters are part of during the unfolding of a Narrative Structure and is similar to the Immersion that books, theater, or movies provide.” This description would place emotional immersion into the storyworld element, but by the name, emotions arise only partially from the stories, and mostly from the representation – the death of a character can be presented comically, as well as tragically.
- Cognitive immersion: “based upon the focus on abstract reasoning and is usually achieved by complex problem solving.” This is equivalent to the GEM element of game mechanics.
- Sensory-motoric immersion: “result of feedback loops between repetitious movements players make to perform actions in the game and the sensory output of the game.” Although the sensory-part of this title suggests the influence of sensory stimulus, this is most significantly about acting and reacting with the proper timing and cognition, which places this pattern into the action element.

4.3 Hunicke et al. (MDA)

The framework of Hunicke et al. (2004) sees three lenses all on the same telescope, one after another. The game developer is looking at the game from the direction of mechanics, through which the dynamics of the gameplay can be seen, and the aesthetics is visible behind both of these. The player experiences primarily the aesthetics of the game, finding the dynamics of the game through it, and can perceive the game mechanisms behind both.

Projected in the GEM, the MDA model would appear to be gazing the game experience from the point of view of aesthetics, towards mechanics, seeing the bottom layer (stimulus, narratives and action) between there as "dynamics". "Dynamics describes the run-time behavior of the mechanics acting on player inputs and each others' outputs over time" (Hunicke et al., 2004), which is highly similar as the lower circle in the GEM manifesting the instantiation-during-game-play of each higher level element of the design. This analysis reveals that MDA is observing a game strictly as a game, through the dynamics face, ignoring the story part of the game, except where it is seen as connected to the game mechanics, or in the aesthetics.

- Mechanics (game mechanics in the GEM): "describes the particular components of the game, at the level of data representation and algorithms." Also, this is the design counterpart of "rules".
- Dynamics (action–stimulus in the GEM): "describes the run-time behavior of the mechanics acting on player input and each others outputs over time." Also, this is the design counterpart of the "system".
- Aesthetics (fantasy and aesthetics in the GEM: "describes the desirable emotional responses evoked in the player, when she interacts with the game system." Also, this is the design counterpart of "fun".

Robson et al. (2015) argue towards using the word "emotions" directly instead of "aesthetics" leading to a MDE model, which has been connected to the OCC model by Mullins and Sabherwal (2018). However, we prefer the term "aesthetics" as emotions are individual and context dependent and cannot be directly designed in the game.

4.4 Ermi and Mäyrä (SCI)

The SCI model of Ermi and Mäyrä (2005) is very close to the GEM model. The main differences are that: (1) The GEM model observes the three elements both as top level conceptual designs, and as instantiative user experiences. (2) The SCI model has been discovered from the context of Communication and Community in Digital Entertainment Services research project (Järvinen et al., 2002, Sect. 4.1). The SCI model is positioned within the social context of the player, which is not considered in the GEM.

The SCI model is named after its three main dimensions:

- Sensory immersion in the SCI model is achieved through the audiovisual execution of games. As such, this is the same as the sensory stimulus in the GEM, including other stimulus, such as the force feedback, and more recently the full mixed reality experience.
- Challenge-based immersion is achieved when the challenge and pacing is just perfect for the player, assumably in accordance to the flow theory, as discussed by Järvinen et al. (2002, Sect. 4.1). This dimension is closest to the GEM element of action, and strongly related to the mechanics.
- Imaginative immersion involves the use of imagination and enjoying “the fantasy of the game”. In the GEM this involves the storyworld, which is the player imagined universe of the game built on the explicitly presented narrative.

Later on Mäyrä (2007) has renamed “imaginative immersion” as “mental immersion” without any other changes to the model, except for placing it inside a more thorough framework of contexts. As with the holistic category of Björk and Holopainen (2004) that is highly similar, we exclude the contextual framework from our model.

The components Ermi and Mäyrä (2005) mention related to the SCI model in the conception of the game play experience, can be fitted in the GEM as well (see Table 2). The *interface* between the player and the game applies sensory stimulus as output and action as input. The rules of the game are a part of the mechanics, where the actions are derived from. The SCI model distinction between challenge-based immersion and rules is relative to the distinction between action and mechanics. The story is the narratives the game tells the player, but rather than the story, Ermi and Mäyrä (2005) perceive that the player’s imagination is immersed to the more holistic fantasy of the storyworld of the game, using their own imagination and empathy towards the characters.

4.5 Adams

Adams (2004, 2013) identifies three forms of immersion that are somewhat similar to the SCI model, but seem to lack the aesthetic form:

- Tactical immersion is the immersion in the moment-by-moment high-speed action. This form is related to the dynamics of the MDA model, in the connection of sensory stimulus and action. As described by Adams, we would rather see this form mostly involving action.
- Strategic immersion is the form “seeking a path to victory”, focusing on winning the game according to the rules. This form is equivalent to the immersion through the GEM mechanics element.
- Narrative immersion is identified by Adams as the one of the three to be present in books as movies as well as in games. Because the tactical immersion requires player action, it is not present, as such, in these “earlier” forms of art. This is unlike the sensory immersion in the SCI model, which, as the aesthetic element

Table 2 A comparison of the model by Ermi and Mäyrä to the GEM.

SCI model	GEM	Comment
sensory immersion	sensory stimulus	Sensory immersion is "related to the audiovisual execution of games."
challenge-based immersion	mechanics, action	Challenge-based immersion "is at its most powerful when one is able to achieve a satisfying balance of challenges and abilities [. . .] related to motor skills or [. . .] strategic thinking".
imaginative immersion	storyworld	Imaginative immersion involves "the fantasy of the game".
interface	sensory stimulus, action	User input and output.
rules	mechanics	Rules are a part of the mechanics.
story	narrative	The story that is told by the game.
space	mechanics	Storyworld in GEM contains the universe of the game. The game mechanics limit how much the player is able to see of the universe, and is part of the narrative that gives a finite glance to the infinite storyworld. The game space of chess is the 8×8 board, thus limited by the rules/mechanics, but the storyworld of chess consists of all the game boards of all the famous and less famous games of chess ever played, as well as all the stories people have about why the black and white king and queen are there with their armies.
meaning	aesthetics	
motivation	—	
motorics	action	
cognitions	aesthetics	
emotions	aesthetics	

of the GEM, can be found in movies, and especially in movies as well. Narrative immersion connects to the GEM element of narratives.

4.6 Summary

Table 3 collects all the analysed models and compare them to the GEM. *The six elements of the GEM seems to be a sufficient set in the sense that by removing any of them from the experience ceases it to be a game.* This impossibility comes in two forms: (1) Although, it is technically possible to take mechanics and action from a game, but then it is no longer a game, as the player has no role in it. (2) There can be no action without sensory stimulus, which necessarily creates aesthetics, whether it is thoughtfully designed or not. Also, if a game has action, game mechanics and aesthetics, then the gameplay necessarily forms narrative, whether it is scripted or not, and a storyworld appears by necessity of the circumstances.

5 Sample case games

In this section, we present two brief examples on how the GEM can be used in analysing a game.

Table 3 A summary of the comparisons.

GEM	Smed and Hakonen	Björk and Holopainen	Hunicke et al. (MDA)	Ermi and Mäyrä (SCI)	Adams
Mechanics	The limits of the game that also cause the conflict and rivalry.	Abstract reasoning and complex problem solving.	Mechanics	—	What the player focuses on.
Action	Concrete gameplay.	Feedback loops of the gameplay performance.	Dynamics	Satisfying balance of challenges and abilities that “can be related to motor skills or mental skills”	High-speed action.
Storyworld	The unveiling of the actions of the hidden opponent.	Participated events related to the unfolding of a narrative structure.	Aesthetics	Use of imagination and empathy towards characters.	—
Narrative	—	—	—	—	What the story audience focuses on.
Aesthetics	Concrete gameplay experience.	The feeling of being inside the game.	Aesthetics	The audiovisual execution of the game.	—
Sensory stimulus	—	—	—	—	—

5.1 *XCOM*

XCOM (Firaxis Games, 2012) is a recent game in the *X-Com* game series. It has quite clear game mechanics, being a turn-based strategy game. The characters can, for example, be commanded to shoot at a target. The game mechanics then involve a random number to be generated and compared against the calculated probability of the shot hitting or missing. If the shot hits, the game engine has several alternative animations to play to represent the hit to the player. This can be tested, by saving the game before a shot, and then executing the shot over and over again, by reloading the saved situation. As *XCOM* provides protection against “save scumming” (Hogarty, 2013), the game mechanical outcome of the shot is each time the same, but the engine varies between the different representations, as they are not essential for the game outcome, and can be freely randomized each time.

Shooting is clearly also a part of the narrative, as it is an understandable action taken by a human-like game character. Like the mouse clicking action connects shooting to the mechanics, the narrative of shooting gets connected to the storyworld, where the war is taking place between humans and aliens, and hi-tech weapons are discovered and used.

The visual representation of the shot confirms the action and mechanics for the player, generating a sense of agency. The same representation also visually and aurally tells the narrative to the player, and provides the aesthetics for painting the storyworld to the player, promoting the suspension of disbelief. This all binds the whole experience together to the fantasy of the *XCOM* game.

5.2 *Hellblade: Senua's Sacrifice*

Well designed aesthetics with well performed sensory stimulus can be used to replace actual game mechanics. For example, in the game *Hellblade: Senua's Sacrifice* (Ninja Theory, 2017) the aesthetics pulls the player into immersion so deeply that in all scenes with fire engulfing the play area, an actual player character damaging mechanism is not necessary, or even as effective in providing the player with a sense of emergency and the need to hurry.

Yin-Poole (2017) remarks that, unlike the game lets the player to understand, the game does not end, if the character dies too many times. The game represents as a visual mechanics, a rot on the character's arm that spreads every time the character dies and is restored to a previous situation. The player is made to believe that if this rot reaches the character's head, the game ends and has to be started over again. Apparently, this is not truly the case. The player can keep on failing and having the character to die over and over again. The rot will not spread past the character's shoulders. However, the effect, once again, gives the player a sense of significance for each death. Although the permanent death of the character is not in the program code, it is scripted into the beliefs of the player. An effect that almost goes beyond what "suspension of disbelief" covers. It provides for a great balance between helping the player to take each attempt seriously, and yet allowing the player to fail during the narrative.

Hellblade weighs heavily on aesthetics, although it has clear and functional mechanics, action, storyworld and narrative too. The game puts the player inside the mind of the main character: the character hears speaking voices in her head, which is represented directly to the player through the speakers. Although the voices, as a mechanic, inform the player about the narrative in the game, they most essentially create the feeling of being a character in the game.

6 Conclusion

In this chapter, we presented the GEM (game experience model) which aims at providing a holistic view into the various aspects present in games. The GEM is intended as a tool for analysing games by recognizing their features through the various faces. It also provides aid for the game designer to inspire the creative process. The contribution of this work should be to help the game development industry to be able to analyse the content of their games and the human resources in relation to each other. Also, when designing something such as artificial intelligence for games, these four segments pose clearly distinctive challenges.

The GEM is composed of the summary of several game designers' and game researchers' formulations. It is based on the study of games, and hence best fitting for game experience. However, digital games are a subclass of digital applications, and thereby the GEM is applicable on a more general area as well. For serious digital

applications, the storyworld is the business environment where the application will be used, for example, a corporate organization or a study life of a student.

Future work is needed in using the GEM in analysing a broader array of games to further validate the model. Furthermore, the GEM might provide interesting insights to the existing player type models. One could perceive “the power player type” to be attracted to the mechanics, “story player type” to the storyworld, and “immersive player type” to the aesthetics. This direction would also seem to point to a bridge towards the field of psychology begging the question why do people experience games in this way.

With the games becoming in increasing magnitude a form of art, the theoretical perception of games is changing. The theories need to be able to facilitate for this new position so that they can account for all essential parts of a game design. The GEM is a further step towards this direction – and perhaps to the Grand Unified Theory of games.

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