MTDA+N – A Working Theory of Game Design[1]

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When considering how to teach fundamental principles of game design, we find ourselves torn between two well-cited frameworks: the Mechanics-Dynamics-Aesthetics Framework (MDA) and the Elemental Tetrad. We want to teach both, because each has its merits, but teaching two seperate frameworks is unnecessarily confusing. This essay therefore develops an initial proposal for a working theory of game design by integrating these two existing frameworks.

The MDA Framework and the Elemental Tetrad

While many have theorized about game design, the two most cited frameworks are MDA (Hunicke et al. 2004) and the Elemental Tetrad (Schell 2008). MDA (Figure 1) defines games in terms of three aspects:

> *Mechanics describes the particular components of the game, at the level of data representation and algorithms. Dynamics describes the run-time behavior of the mechanics acting on player inputs and each others' outputs over time. Aesthetics describes the desirable emotional responses evoked in the player, when she interacts with the game system* (Hunicke et al. 2004 p. 2).

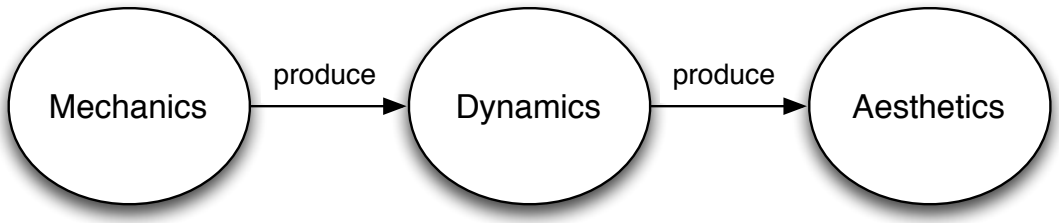

Figure 1: The MDA Framework (adapted from Hunicke et al. 2004)

Briefly, game designers manipulate the workings of the game (e.g. rules). Player interactions with game mechanics create dynamics; e.g., offside rules in football, rugby and hockey encourage teams to stay together (herd behavior). These dynamics, in turn, affect the player's emotional experience or aesthetics (e.g. fellowship).

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Meanwhile, the Elemental Tetrad (Figure 2) comprises four elements: mechanics, technology, aesthetics and story (Schell 2008). Schell defines *mechanics* as "the procedures and rules of your game" (p. 41) and discusses six mechanics – "space", "objects", "actions", "rules", "skill" and "chance". Space is where the users engage with the game (both virtual worlds and physical space). Objects are tools used by the player to advance in the game. Actions are how the player interacts with objects. Rules govern the game environment. Skills are physical, mental and social abilities used by a player to win the game. Chance refers to the randomness and uncertainty that exists in games. Clearly, space, objects, actions, skill and chance are not simply procedures and rules as Schell suggests.

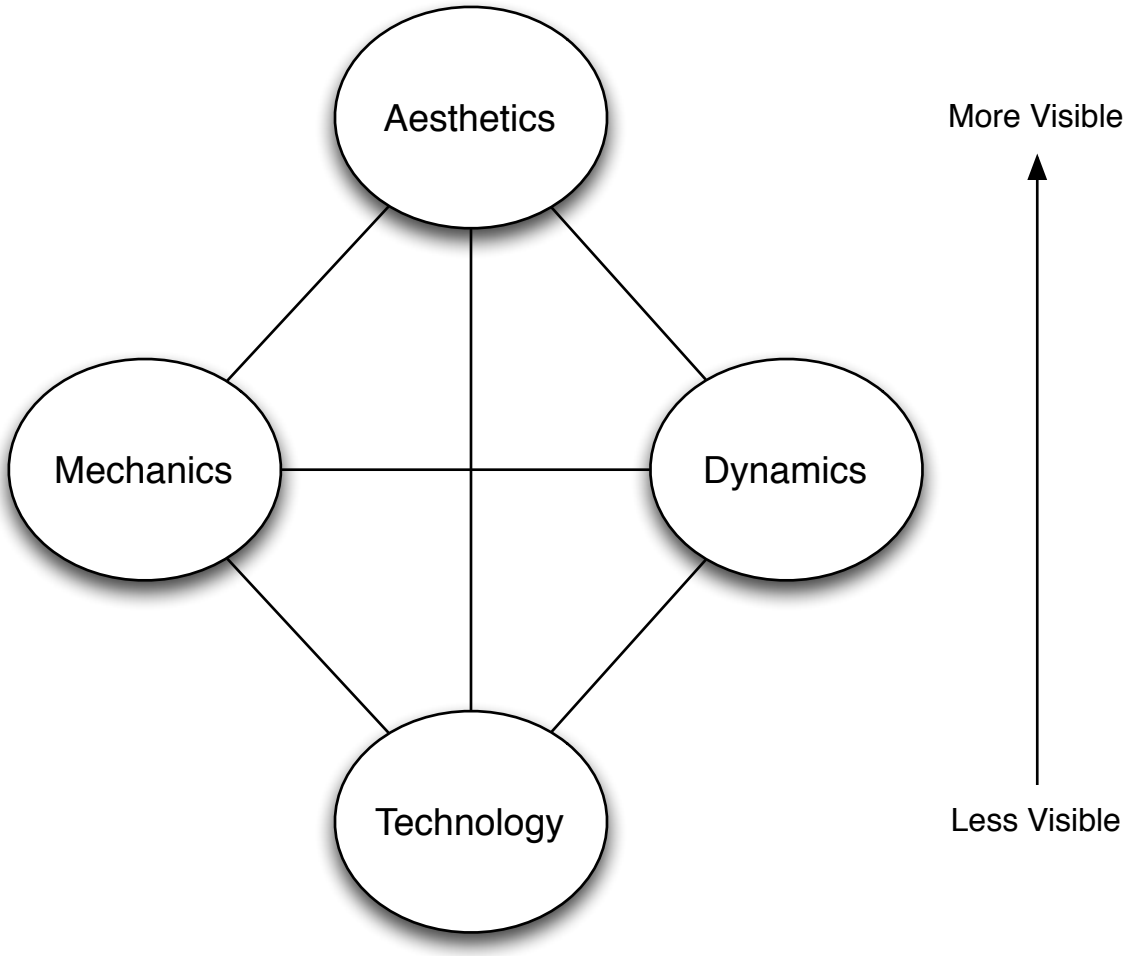

Figure 2: The Elemental Tetrad (adapted from Schell 2008)

Technology refers to the tools and systems used to implement or deliver the gameplay. The same mechanic (e.g. space) may be implemented using many different technologies (e.g. cardboard game board, mobile phone screen, game console). Aesthetics describes "how your game looks, sounds, smells, tastes, and feels" (Schell 2008 p. 42). Table 1 lists some examples of mechanics, dynamics, aesthetics and technology.

Table 1: Examples of Mechanics, Dynamics, Aesthetics and Technology

Mechanics	space, actions, rules, skills, chance, sprites, combos, quests, levels, points, timers
Dynamics	twitch gameplay, strategic gameplay, grinding, bluffing, gambling, herd behavior, infinite (arcade-style) gameplay, time pressure, difficulty
Technology	game board, cards, dice, racquet, ball, game console, random number generator, motion sensor, monitor
Aesthetics	challenge, discovery/exploration, drama, expression/creation, fantasy, fellowship, puzzle, sensation, submission

Notwithstanding some differences in language, the two frameworks broadly agree on the presence of mechanics and aesthetics. Hunicke et al. make a convincing case for including dynamics and Schell makes a convincing case for including technology. It therefore appears reasonable to include all four elements in our working theory. *Story*, however, is more complicated.

Deconstructing Story

Schell (2008) defines story as "the sequence of events that unfolds in your game" (p. 41). Most if not all games may have a story in Schell's sense of a sequence of events – even the sequence of falling blocks in Tetris would be a story using Schell's definition. However, *story* usually denotes "a narrative of real or, more usually, fictitious events, designed for the entertainment of the hearer or reader; a series of traditional or imaginary incidents forming the matter of such a narrative; a tale" (Oxford English Dictionary 2013). Many games (e.g. checkers, roulette, Cut The Rope) clearly do not have a story in the dictionary sense of a meaningful narrative.

We therefore avoid the term *story* due to its overloaded meaning in game design and research. Instead, we discuss three types of narratives that a game may include or contribute to:

1) Embedded Narratives. The defining feature of an *embedded narrative* is that it is told to the player by the game's creators. In the *string-of-pearls* story method, the player experience oscillates between interactive gameplay and storytelling (Schell 2008). For example, the Mass Effect, Fallout, Walking Dead and Elder Scrolls series use intermittent cutscenes to build narrative. However, cut scenes are only one method of embedding narratives. In BioShock, for instance, much of the narrative is embedded in the artwork and audio dialog during gameplay. Other games have little or no embedded narrative. Embedded narratives occupy the same conceptual level as mechanics.

2) Emergent Narratives. The defining feature of an *emergent narrative* is that it is created by the player(s) using the game. In Borderlands 2, for instance, shooting the helmet off a *goliath* enemy will cause it to chase and attack whichever friend or foe is nearest, leveling up as it goes. This

facilitates an emergent narrative – the player sets off the goliath from afar, the goliath clears out its own base, the goliath chases the player to another enemy base, the goliath defeats the new base and only then does the player take down the goliath. The player experiences this as an interesting sequence of events - an embedded narrative. Other games (e.g. SimCity, Railroad Tycoon, DayZ, Rust) rely entirely on what Schell (2008) calls "the story machine method"; that is, they are designed to produce interesting sequences of events, which may be perceived as stories by players (Schell 2008). While some games strongly encourage emergent narratives, most if not all games may form part of an emergent narrative given a sufficiently creative player. Emergent narratives occupy the same conceptual level as dynamics in MDA, and are observable by non-players.

3) Interpreted Narratives. When a person reads a book, the narrative they absorb may differ from the narrative that is written. People visualize environments, interpret characters' actions, speculate about authors' intentions and generally assign meaning to what they read. Sometimes people misread or misunderstand. Similarly, the narratives absorbed from the gaming experience may differ from either the embedded or emergent narratives. We therefore use *interpreted narratives* to refer to the player's mental representation of emergent or embedded narratives. These occupy the same conceptual level as aesthetics, and are not strictly observable. Again, a game may or may not produce interpreted narratives.

A Working Theory: MTDA+N

Armed with our more nuanced conceptualization of game narratives (above), we can now proceed to combine MDA and the Elemental Tetrad (Figure 3). While others (e.g. Millán 2012) have suggested combining these two frameworks, we are not aware of any work that has done so at the level of depth attempted here. We will refer to the result as the Mechanics, Technology, Dynamics, Aesthetics plus Narratives Framework (MTDA+N). Its core concepts are defined in Table 2.

Informally, players interact with game mechanics and (possibly) experience embedded narratives through technologies. Dynamics and (possibly) emergent narratives arise from player-game interactions. Aesthetics and (possibly) interpreted narratives are formed in the player's mind; these are affected by dynamics and (possibly) emergent and embedded narratives. Here we use dynamics in a slightly broader sense than Hunicke et al. – to denote all kinds of emergent patterns of player-game interaction. For example, fast moving sprites contribute to twitch gameplay (which tests reaction time), while turn-based mechanics create more strategic gameplay (which tests strategic thinking).

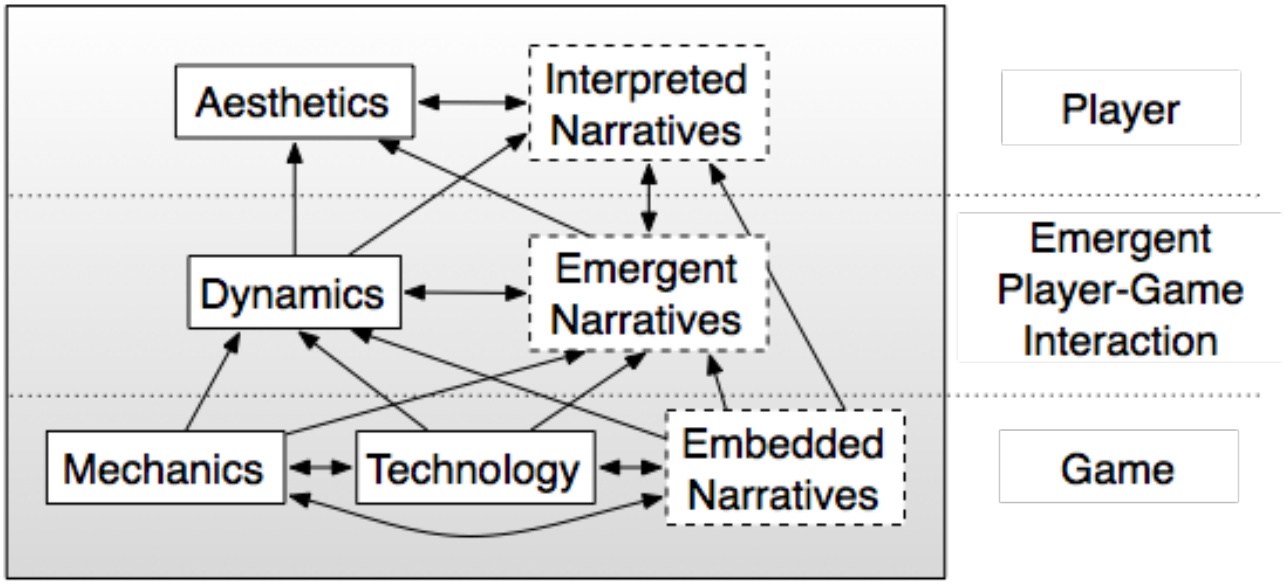

Figure 3: MTDA+N Conceptual Framework

Notes: Arrows indicate interactions; rectangles indicate concepts; dashed lines indicate optionality.

Table 2: Definitions of MTDA+N and Work System Concepts

Concept	***Definition***
Aesthetics	the emotional responses a game evokes, or is intended to evoke, from the player during gameplay
Dynamics	emergent behavior of both the game and the player during player-game interaction
Embedded Narrative	A meaningful sequence of events intentionally embedded in a system by its creators; a plot.
Emergent Narrative	A sequence of events that arises dynamically from participant-system interaction and is perceived as meaningful by participants
Interpreted Narrative	A participant's mental representation of an embedded or emergent narrative
Mechanics	algorithms, rules, objects, actions and other game components, which are manipulated by game designers to create challenges for players
Technology	tools and systems used to implement or deliver gameplay

MDTA+N obviously has greater explanatory power than either MDA or the Elemental Tetrad. Lacking technology, MDA is ill-suited to analyze how interface technologies affect player-game interactions, for instance, how using a gamepad versus a mouse and keyboard changes a player's experience of a first person shooter. Similarly, lacking dynamics, the Elemental Tetrad is not suited to analyze how certain behaviors (e.g. grinding) are created by some mechanics (e.g. fetch quests), mitigated by others (diminishing experience from repeated actions) or how they affect aesthetics (e.g. more submission, less discovery). Moreover, both MDA and Elemental Tetrad are ill-suited to analyze how game mechanics can cause differences between embedded and interpreted narratives. For example, if the writers are trying to tell a story about a benevolent, honorable hero through cut-scenes while the developers include mechanics for murdering civilians in their sleep and looting

their homes, the player's interpreted narrative is likely to differ from the writer's embedded narrative.

Conclusion

A useful and communicable theory of game design is needed to help game designers and academics speak a common language, to legitimize the study of game design among other social sciences and to educate the next generation of game designers. This essay therefore develops an initial proposal for a working theory of game design.

Some important concepts (e.g. bugs, critical reception, level of mature content) are not addressed by MTDA+N. Furthermore, MTDA+N does not attempt to unpack the *player* (e.g. player types, play personas, play motivations) or player-game interaction (e.g. immersion, flow, mindfulness). Indeed, developing a unified theory of the player is extremely challenging (cf. Canossa 2009) and is best left to future work.

Despite its limitations, however, we hope that MTDA+N is useful for teaching fundamentals of game design, clarifies some core concepts (especially the different kinds of game narratives) and provides a unified starting point for future research to refine and extend.

References

Canossa, A. 2009. "Play-Persona: Modeling Player Behaviour in Computer Games," PhD Dissertation. Danish Design School of Copenhagen, Denmark.

Hunicke, R., LeBlanc, M., and Zubek, R. 2004. "MDA: A formal approach to game design and game research," In Proceedings of the Challenges in Games AI Workshop, Nineteenth National Conference of Artificial Intelligence, San Jose, CA.

Millán, J. R. 2012, July. "The Elements of Game Design," *Lakitu's Dev Cartridge*. Online: http://lakitusdevcartridge.wordpress.com/2012/07/05/the-elements-of-game-design/#more-1359

Oxford English Dictionary. 2013. Oxford University Press.

Schell, J. 2008. *The Art of Game Design*, Morgan Kaufmann.