Journal of Electronic Gaming and Esports, 2023, 1, 1-14
https://doi.org/10.1123/jege.2022-0045

Human Kinetics
ORIGINAL RESEARCH

An Ecosystem Framework for the Meta in Esport Games

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This paper examines the evolving landscape of modern digital games, emphasizing their nature as live services that continually evolve and adapt. In addition to engaging with the core gameplay, players and other stakeholders actively participate in various game-related experiences, such as tournaments and streaming. This interplay forms a vibrant and intricate ecosystem, facilitating the construction and dissemination of knowledge about the game. Such knowledge flow, accompanied by resulting behavioral changes, gives rise to the concept of a video game *meta*. Within the competitive gaming context, the meta represents the strategic and tactical knowledge that goes beyond the fundamental mechanics of the game, enabling players to gain a competitive advantage. We present a review of the state-of-the-art of knowledge for game metas and propose a novel model for the meta knowledge structure and propagation that accounts for this ecosystem, based on a review of the academic literature and practical examples. By exploring the dynamics of knowledge exchange and its influence on gameplay, the review presented here sheds light on the intricate relationship between game evolution, player engagement, and the associated emergence of game meta.

Keywords: metagame, metagaming, MOBA, DOTA 2, trading card games, TCG, game context, game development, game design

Modern esports are increasingly persistent games that evolve and change (Dubois & Weststar, 2022). Players and other stakeholders interact not only with the game itself but also with contextual experiences constructed around the game itself, such as tournaments, broadcasts, live streams, local leagues, and various types of events (Block et al., 2018; Zaiets, 2020). This creates a dynamic, complex ecosystem within which knowledge about an esports game—and how to play it—may be constructed and disseminated on an ongoing basis. This flow of knowledge and the resulting behavioral changes (how the game is played) give rise to the *meta* of a video game. The meta is an underexplored topic in video games research generally and esports research more specifically: In the context of competitive gaming, the *meta* refers to the sum total of knowledge that goes beyond the basic mechanics of the game and is widely used to gain a competitive advantage. The meta of a game includes for example the most popular character builds (player-controlled characters), team compositions, item purchases, and overall playstyles that are currently considered to be strong and effective (adapted from Kokkinakis et al., 2021).

The meta can be influenced by various factors, such as updates and changes to the game's mechanics or balance (Claypool et al., 2017), as well as the emergence of new tactics and strategies that can counter previously dominant playstyles. Importantly, the meta can change as a result of the activities of all stakeholders involved. For example, a game company can change parameters in a game and release a description of these changes, which thus evolves the meta. Some players can then devise new strategies to take advantage of those changes, which further evolves the meta. Similarly, tournament commentators can talk about the effectiveness of specific game strategies, which then propagate through the community and thus add to the meta. Esports players often pay close attention to the meta and adjust their own strategies and choices accordingly in order to stay competitive and effective in the game. This can be an essential aspect of competitive esport games (Block et al., 2018; Kokkinakis et al., 2021; Salen & Zimmerman, 2003).

For players and professional teams, the tools and requirements to aid them in the discovery of new strategies and the analysis of gameplay, which are similar to traditional sports, are essential for teams to maintain their competitive advantage in the scene (Demediuk et al., 2019; Kokkinakis et al., 2020; Medler & Magerko, 2011). In the broader landscape, players and the communities surrounding a game often work together to find the best strategies to play and win, forming a defined accepted meta of a game at a given period (Drachen, 2017). This phenomenon has existed in traditional tabletop games such as *Chess*, where there are defined opening moves that have proven effective, with defined ways to play against or react to them. However, unlike *Chess*, esports games can be more dynamic and substantially more complex. They have parameters that change through gameplay updates, where developers can tweak certain aspects of the game to keep the game fresh, keeping players and tournament broadcast audiences engaged (Block et al., 2018; Demediuk et al., 2021; Hodge et al., 2021; Pedrassoli Chitayat et al., 2020), extending the longevity of a game's lifespan (Claypool et al., 2017; Zhong & Xu, 2021). This ebb and flow of knowledge, such as strategies, and the structures surrounding the game cause the meta to shift over time, forming a dynamic system within the greater game ecosystem.

Additionally, the "meta" can play a significant role in game research, providing insights into player behavior (Drachen et al., 2014), evaluating game design impact (Sicart, 2015), and identifying player preferences and trends (Demediuk et al., 2019; Eggert et al., 2015), thus driving innovation and driving knowledge advancement.

Understanding the complexities of competitive game metas is important for players, who can gain competitive advances, for

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developers to maintain balance and competitive integrity of their games, and for game researchers, because it allows evaluation of player behavior, design impact, identify trends, and more.

Contributions

In this paper, we propose a refined definition of the meta for competitive games and esports through a review of the existing literature and practical examples. From the review, we then propose three components to a model to assist in understanding the meta's constituents (Kokkinakis et al., 2021) and its propagation through a game's community. Finally, we bring the proposed components together into a theoretical framework that broadly represents a meta ecosystem for esport games. The structure of the paper is as follows:

- We develop a knowledge structure to the meta, based on existing literature, consisting of three top-level categories, in-game strategies and resources, player–game interface, and peripheral interactions.
- We present a new framework for the meta of competitive games, containing the novel aspects of the meta knowledge structure, meta knowledge propagation, and community acceptance.
- Lastly, we provide a review of the state-of-the-art knowledge about esport metas, adding a community layer to the existing definition based on the framework proposed.

Background: The Evolving Definitions of "Meta" in Video Games

The term "meta" comes from the Greek word that means "beyond" or "transcending" (Harper, 2021). The meta has been discussed in games research for over two decades (e.g., Forbeck et al., 2000; Salen & Zimmerman, 2003). Perhaps not surprisingly, the definition of the meta in the context of games, and competitive games (esports games), has been inconsistent, with various definitions provided by previous works within and outside academic literature (i.e., in grey literature; Carter, 2015; Carter et al., 2012; Donaldson, 2016, 2017b). There is yet no commonly established definition of what the meta constitutes across games research. Therefore, it is essential before proceeding further to elucidate the current state-of-the-art definition of the meta in the context of games.

In early "meta" research, Richard Garfield, the creator of Magic: The Gathering (Wizards, 1993), defines the meta as "how a game interfaces with life" and consists of four components: What players bring to a game, what players take away from a game, what happens between games, and what happens during a game (Forbeck et al., 2000). Further work has consolidated the definition of metagaming to "the relationship between the game and outside elements," including player attitudes, playstyles, social reputations, and the context in which the game is played (Salen & Zimmerman, 2003).

Earlier definitions of "metagame" suggest that the term covers only activities outside *"The Magic Circle,"* the imaginary or physical space where special rules apply during a game (Juul, 2009). Inside the circle, actions that may be deemed rude or unacceptable outside the game may become acceptable or even strategic (Smith, 2006). Carter et al. (2012) more recently have proposed that "metagame" actions can occur both within and outside the circle but outside the gameplay context. This can include actions such as trash-talking opponents to affect them psychologically (Carter, 2013; Wright et al., 2002).

Moving outside of "The Magic Circle," Boluk and LeMieux (2017) propose that actions that attempt to gain a competitive advantage, but located outside the immediate context of the game, can be classed as "metagaming." This covers activities such as analyzing game states to produce effective strategies (theorycrafting) or taking advantage of tournament structures (Carter & Gibbs, 2013; Mortensen, 2010). An example of this is in championship Chess between 1940 and 1978, where Soviet players worked together in tournaments through analysis of game piece positions and collusion (such as forcing a draw between themselves) to progress further (Moul & Nye, 2009).

Recent work on refining the state-of-the-art of the meta is by Kokkinakis et al. (2021), which proposed that the "meta" in games consists of the *metagame* and *metagaming* as follows:

- The *metagame* refers to activities related to the core gameplay, such as the most dominant set of in-game strategies at any given time.
- *Metagaming* is "the relationship between the game and outside elements" (Salen & Zimmerman, 2003), which involves activities surrounding the gameplay itself and is a dynamic and shifting ecosystem. This includes actions such as planning strategies for the next match, taking into account an opponent's reputation and playstyle, developing strategies that target them specifically, or taking advantage of tournament structures, such as purposely losing a game not to be matched up against a better team in the next phase.

While the recent review and definition by Kokkinakis et al. (2021) do bring some consistency to this important topic within esports, the definition does not address how the meta develops within a game's community nor does it attempt to bring structure to this complex topic, which this article is attempting to achieve.

It is important to note that while the metagame refers to direct in-game aspects within the magic circle, metagaming actions can occur inside and outside the circle's boundary. For example, trash-talking an opponent when playing a game, making them more prone to mistakes, occurs inside the magic circle, even though it is not part of the core gameplay.

Review Methodology

Search for the literature for this review has used the following sources: Scopus, IEEE, ACM, Springer, ScienceDirect, Google Scholar, and Web of Science, with the items of journal articles, conference papers, technical reports, and books included in the search. The keywords and phrases used in the initial full-text sweep were both individual and combinations of the following phrases:

Multiplayer online battle arena (MOBA), meta, metagame, metagaming, esports, DOTA 2, League of Legends, software updates, gameplay patch, gameplay updates, game data, Hearthstone, and Magic: The Gathering.

The scope was limited to works written in English. Last, the platforms of Connected Papers (Connected Papers, 2022) and Research Rabbit (ResearchRabbit, 2022) were then used to find further relevant works through the "snowball" method of chaining references to expand the search.

A Preferred Reporting Items for Systematic reviews and Meta-Analyses flow diagram (Figure A1) is present in the Appendix of this article showing the review process of the literature. As the services of Connected Papers and Research Rabbit are novel, there are few pre-existing works utilizing it (Kaur et al., 2022; Lewis, 2022; Liu & Ali, 2022). However, it has been useful in this instance, highlighting supplementary academic works that otherwise may have been missed, and showing which of the articles are regarded as important.

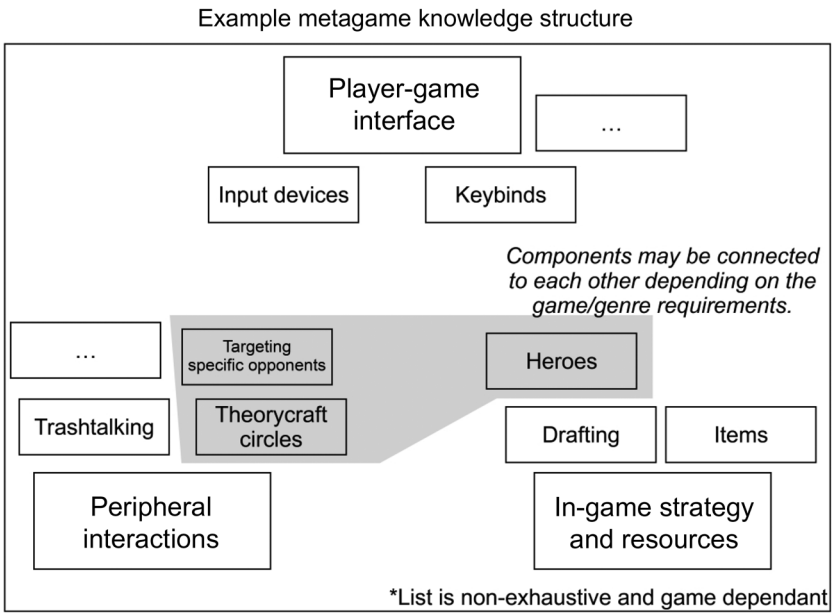

Figure 1 — Metagame knowledge structure example.

The articles were then categorized into three main categories; articles which summarize the general metagame concepts at a high level ($n = 39$), such as Debus (2017), Donaldson (2017b), and Kokkinakis et al. (2021); articles that investigate more specific aspects of the phenomenon at a low level, such as Hodge et al. (2021), Katona et al. (2019), and Kokkinakis et al. (2020; $n = 61$); and finally, articles on topics that surround the metagame which highlights its importance such as Zhong and Xu (2021; $n = 40$). This categorization process was done to aid in the synthesis of the models we are proposing by drawing from and connecting high-level to low-level literature. A corpus of the included papers (that are uncited in the text) is included as an Appendix. This brings the total number of academic articles included to $n = 140$.

As research on esports tends to involve input and knowledge from its respective communities, the inclusion of "grey literature" is essential for research in this field. These works are used as supplementary articles in the review or to highlight practical examples that have occurred within the space in which peer-reviewed articles have discussed specific phenomena.

The literature was found as part of the search through reference entries from peer-reviewed work and from a general search on internet engines for real-life events that have occurred in esports. It is important to note that although grey literature is not peer-reviewed, the works included in this review are written by prominent figures in the MOBA and esport communities, and claims are usually backed up by game data or evidence in terms of game replays. Further, this literature can form live opinions on certain metagames, as they were written in that time frame.

Findings: A Meta Knowledge Structure Model

In subsequent sections (3 and 4), we elucidate the insights derived from our review. Section 3 delves into the architecture of the *metagame*, its evolution, and the processes by which players engage in metagaming to generate new metas. Section 4 explores the mechanisms through which information related to the metagame is disseminated among players. Each of these sections offers a synthesized understanding of distinct facets of the meta ecosystem concept, which will be discussed in "Discussion—Synergising the Meta Ecosystem" section.

Meta Knowledge Classification

A major theme found in recent discussions on the metagame has shifted toward categorization and component systems. For example, Donaldson (2017b) suggested two game expertise layers comprised of binary elements: mechanical and metagame expertise. This dichotomy is evident in First-Person Shooter games, where adept players need to master avatar control, aiming skills, and metagame knowledge. A player with excellent mechanical skills but lacking metagame expertise is at a disadvantage compared with those proficient in both areas.

Further, this theme is also present in Debus (2017) which proposed five metagame classes: material, social, strategic, and rule-based metagame, where each class represents a unique aspect with potential optimal manipulative strategies. The material metagame, for instance, can refer to equipment choices in a tennis game, a specific button layout, or even a unique way of holding a game controller. In esports, "hypertapping" in competitive Tetris is a perfect example, entailing controller setting adjustments and an alternate console holding technique (Laroche, 2018). Other instances include players' hotkey arrangements (Brock & Fraser, 2018) or the use of the quick cast function in MOBAs (Gealogo, 2021).

Metagaming can also be conceptualized into classes. Richard Garfield initially divided the meta into four categories: game resources, strategic preparation, peripheral resources, and player reputation (Forbeck et al., 2000; Salen & Zimmerman, 2003). As discussed previously, the concept of *metagaming* can involve leveraging the structures that surround a game, a practice evident in various genres, from roleplaying games to competitive esports. Players often utilize information external to the immediate game to secure an informational edge or predict forthcoming events via

social cues. For instance, in Dungeons and Dragons, the dungeon master reaching for the dice or the crowd cheering in a live esports tournament may signal what might occur next or provide insights into opponents' actions (Boluk & LeMieux, 2017).

Although aspects of the meta have been classified as discussed above, and there is evidence of connections between the classes (Donaldson, 2017b), it is still unclear on which specific components relate to each other in general.

The Dynamics of Meta Generation: Social Metagaming

A process that players use to process their understanding of the metagame is theorycrafting (Paul, 2011), which involves exploring the most effective strategies to utilize in a game. For instance, in competitive trading card games, particularly skilled players collaborate privately to devise decks and strategies for upcoming tournaments. Each participant contributes their knowledge and ideas about how the game should be played, eventually forming a collective understanding of the meta within the group. Access to these groups requires a reputation for high-level gameplay, usually attained through performance or recognition by notable community figures (Boluk & LeMieux, 2017). Therefore, this not only represents metagaming through preparation but also the acquisition of exclusive information through social metagaming (Debus, 2017). This falls into the peripheral resource category of the meta (Forbeck et al., 2000), suggesting potential classification into related subtypes. Another example is MOBA esports' "scrims" or private practice matches among professional DOTA 2 teams and private leagues where existing members must endorse newcomers (Ghannam, 2013; Kathuria, 2021).

While the meta can organically evolve within each community's context, the driving force behind this evolution often arises from the laborious efforts of esports professionals (Brock, 2017). Hence, the "labor of professional gameplay" is central to the progression of esports. Professional esports consist of a limited pool of highly skilled players who can shape and disseminate information to a vast array of amateur and leisure gamers via streaming and broadcasted content (Johnson & Woodcock, 2021). These professional players need to refine their physical skills continually, which can be physically taxing, given the significant actions per minute that certain games demand. Additionally, they need to consistently engage in theorycrafting to innovate their strategies and discover novel ways to exploit their game's mechanical constraints to maintain a competitive advantage (Brock & Fraser, 2018).

The theorycrafting process often involves both the match participants and an analytical support team, consisting of analysts or other players not immediately involved in the tournament match. This team analyzes and devises new strategies for future matches (Ferrari, 2014), much like Chess studies where players evaluate the current board state and future move viability. Similarly, in esports, teams review past matches to identify overlooked elements in the heat of gameplay (Paul, 2011). This practice enables a deeper understanding of game mechanics and opponents, helping to develop strategies targeting an upcoming opponent's weaknesses or an overarching strategy to challenge the tournament's prevalent meta (Lee & Ramler, 2017).

Considering the substantial time esports professionals, particularly players, allocate for preparation, gameplay, and debriefing, the line between work and play often becomes blurred (Brock, 2017). They transform their passion into a lifestyle revolving around their chosen game. Consequently, their outside-game activities or decisions can influence meta outcomes, such as employing certain strategies while streaming their games publicly. Additionally, the advent of game data platforms like Opendota (Chung, 2015) allows the public and future opponents to observe the strategies they practice. This convergence of play and work can place a significant burden on professional players, as gameplay permeates their lifestyles (Johnson & Woodcock, 2021).

From this discussion, it becomes apparent that professional players are engaged in a continuous theorycrafting cycle, potentially formulating meta-defining strategies (Paul, 2011). Thus, when influential pro-players employ or comment on emergent tactics, the community may be more inclined to accept these strategies as part of the meta. A notable example is the rapid integration of the hero "Razor" in Dota 2's meta, where professional players solidified their popularity through online discussions within a week (Gopujkar, 2022).

Conceptualizing the Meta as a Knowledge Structure Model

As a summary of this section, the meta encompasses various aspects of competitive gameplay, but existing definitions primarily address it in the context of the most popular or successful strategies within a specific time frame, based on information from both within the game and its surrounding structures (Boluk & LeMieux, 2017; Debus, 2017; Kokkinakis et al., 2021; Mesentier Silva et al., 2019). The meta can also be viewed as a series or set of specialized skills that players must acquire or excel at (Donaldson, 2017b), which can be further categorized as meta components. By understanding these relationships, we can gain valuable insights into player performance and the specific skills tested by a game or meta. This knowledge can help developers optimize gameplay updates and enable esports professionals and players to focus on particular skillsets for a competitive advantage (Salen & Zimmerman, 2003). For instance, Magic: The Gathering Limited format tournaments employ a restricted card pool, testing not only in-game player skills but also their deck construction abilities, a skillset distinct from face-to-face play (Wiki, 2022). This highlights the various interrelated components of the meta shown in Figure 1.

Thus, we propose the first part of the ecosystem framework in Figure 1. Rather than being viewed as a single, unified state, the meta can be seen as a structure consisting of numerous interconnected components. We propose that these components can be classified into three categories: the player–game interface, in-game strategies and resources, and peripheral interactions. Different games may have unique meta elements; for example, a First-Person Shooter game may not have a drafting aspect that MOBA games possess. To illustrate our proposed model, we use practical examples from MOBA games due to their well-documented nature, as well as the authors' familiarity with the genre:

Figure 1 presents each component as a specific aspect of a game's meta, such as the viable hero pool, or synergies, in MOBA games. The content and number of nodes in the diagram will vary by game, with the number of nodes being dynamic depending on future updates and new content. Connected nodes, whether inter- or intratree, can also represent submetagames within the overarching meta, such as the laning phase metagame in MOBAs (Kokkinakis et al., 2021). Consequently, nodes related to these submetagames may evolve and change faster than other components. Further, during the laning phase, smaller scale synergies can exist between individual heroes, allowing this component to be further divided into lane synergies and macrolevel team synergies.

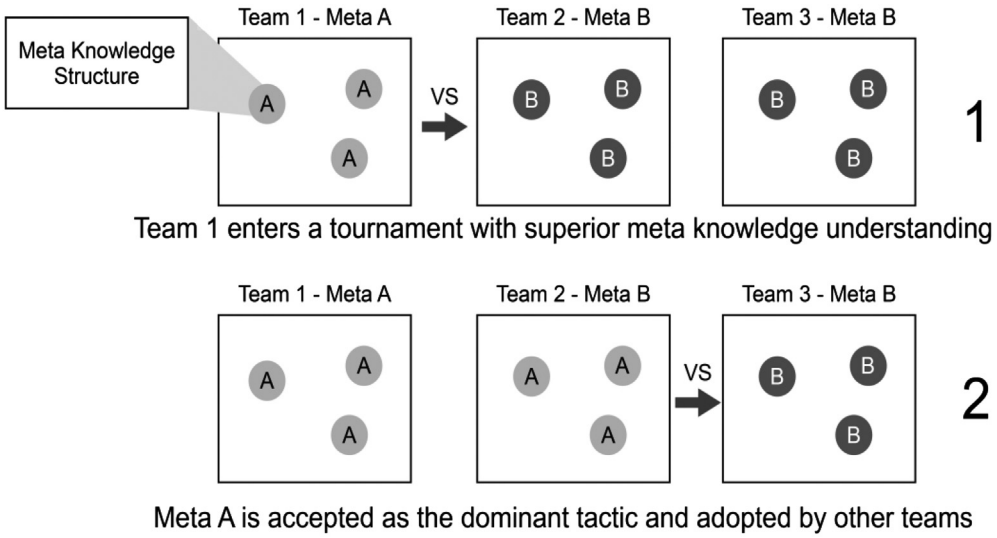

Figure 2 — Metagame propagation in an example tournament.

Findings: A Model for Metagame Propagation

This section disseminates our synthesis of the propagation of metagame information through an esport game's community. We also propose the second part of our model that addresses this propagation, derived from our review of the literature.

Different Metas for Different Communities

While the metagame can generally be described as the overarching strategy most effectively employed in a game, it is important to note that players belonging to different community circles within a game may engage in distinct metagames (Kokkinakis et al., 2021). This variation can stem from disparities in expertise levels or geographical location; therefore, not having the opportunity to play together, resulting in no knowledge exchange occurring. For example, studies have shown that players of varying skill levels in MOBAs have different movement and position patterns on the game map, both individually and in relation and their teammates (Drachen et al., 2014).

Applying the above to professional teams and players whom often practice privately, akin to theorycrafting circles discussed previously, they foster strategies that remain unknown to the larger community. Teams then use these opportunities to refine and test their devised strategies in a highly skilled and private setting (JoinDotaForums, 2014). These strategies are then showcased during public events like tournaments, demonstrating their effectiveness. The general player base may adopt successful strategies, integrating these proven tactics into the current meta.

For instance, team OG esports (www.ogs.gg) using the hero "Io" (which was designed as a supporting hero) to play as a "carry" (main damage dealer) in The International 2019 DOTA 2 tournament (Gilroy, 2021) dominated the competition, leading to its rapid integration into the prevailing meta where teams were banning the hero at the first opportunity for the rest of the tournament (Wong, 2022). This illustrates that a strategy's ascension to the meta requires not only its effectiveness but also its acceptance by the community (be it subcommunities or the broader player base) as one of the top strategies in the game. Events like tournaments may serve as catalysts in this process, disseminating strategic knowledge widely within the game's community.

A theme we found in both academic and grey literature is that developers often react to these shifts in the metagame by issuing updates. For example, DOTA 2 developers, Valve, updated the game following the International 2019 tournament to diminish the effectiveness of the Wisp carry strategy (Valve, 2019). Another such response was seen after the International 2021 tournament when the hero "Magnus" was "nerfed" (made worse) due to the player "Collapse" exploiting it to an "uncounterable" extent, leading his team to tournament victory (Purdue, 2021). These instances highlight that even if a solved meta is known to individuals, without widespread propagation, it does not truly become the meta.

The Relationship Between Developers and the Gaming Community

The evolution of the metagame typically involves a cycle of ignorance, understanding, and stability (Kokkinakis et al., 2021). Metagame disruption primarily stems from the intentional changes introduced by developers through gameplay updates, although it can also naturally evolve due to the influence of professional gamers and live streaming, as discussed earlier.

Updates are a frequent occurrence in contemporary esports games such as MOBAs, but not all updates influence the metagame. Those that do not typically involve bug fixes, visual enhancements or skins, and quality of life improvements for players. These nonmeta-impacting updates can be issued as frequently as several times a week (Steam, 2023). However, meta-impacting updates often involve the addition of new content or gameplay-balancing modifications, designed either to disrupt the existing metagame or to rectify any newly discovered game-breaking issues. Such updates help to prolong the game's lifespan and sustain player engagement by continuously refreshing the game experience (Zhong & Xu, 2022).

While regular update cycles can be advantageous for developers, they might potentially detract from the player experience. Previous work has shown that gameplay updates bolster player activity (Hyeong et al., 2020), but the constant evolution prompts a query regarding game mastery: Is true mastery attainable in an

ever-changing environment (Svelch, 2019)? Considering the proposed meta knowledge structure model, developers can choose to modify specific components for players to relearn, leaving other strategies or mechanics untouched. This approach reduces the adaptation burden with each update. Conversely, developers might intentionally challenge players to devise new strategies rapidly, akin to trading card games draft tournaments where players are provided with a randomized card set or unique ban list for specific events (Wiki, 2022).

There have been instances where developers' actions in response to unforeseen deviations in gameplay have proven controversial. For instance, in League of Legends, a prominent player known as "Adellaideskyhart" faced the threat of an account ban for what the game's developer, Riot Games, viewed as unconventional in-game behavior for specifically playing a "champion" in a support role rather than as a carry (TheLoLHounds, 2016). This led to widespread debate and disagreement within the online community, as the proposed penalty was viewed as contentious. While the player did not technically violate Riot's explicit rules, the approach did challenge the prevailing metagame norms regarding player roles (Donaldson, 2017a). This incident underscores how the actions of both developers and players within the context of the metagame can significantly impact a game's broader ecosystem and perceptions of developer responses to specific actions and parameters that affect the metagame and metagaming activities.

Conceptualizing the Propagation Model

To summarize our synthesis for this section, we use an esport tournament as an example. During tournaments, teams may bring their own interpretation of the meta to the competition, developed from practice and analysis (Codsi & Vetta, 2021; Paul, 2011). However, as the games progress, they may discover that their understanding is less effective compared to that of other teams, as suggested by Hodge et al. (2021). Consequently, these teams adapt their strategies and gain a fresh understanding of the metagame by observing or competing against other teams. As the tournament unfolds, an overarching metagame emerges, which becomes the accepted meta for the event. All participating teams gradually conform to this prevalent meta.

This process is illustrated in Figure 2, demonstrating the model of meta-propagation and acceptance. Figure 2 elucidates that the metagame structure model (shown in Figure 1) represents a players' understanding of the meta. From there, players who come into a tournament with a superior metagame understanding propagate this knowledge to other teams that then adopt the strategy set shown on Figure 2.

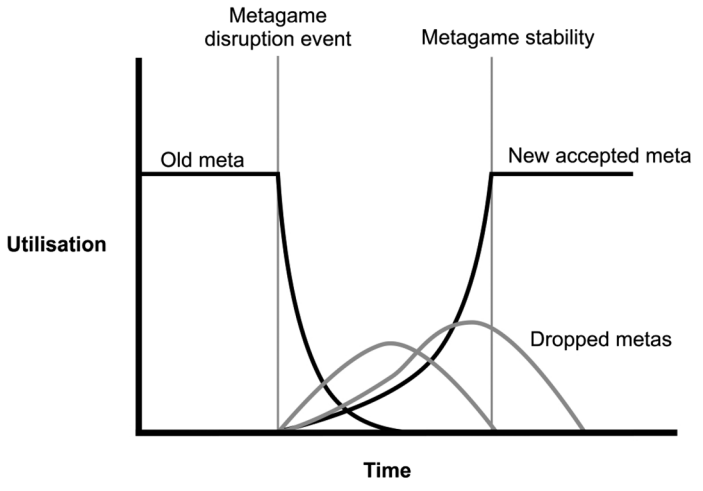

Figure 3 — Metagame utilization over time.

Tournaments are not the only way knowledge of the metagame can transfer within a community. Thus, social metagaming (Debus, 2017) serves not only as a strategy for players to gain a competitive advantage but also as a means to enhance the overall gameplay quality. This is evident in a study about a group of World of Warcraft players (Paul, 2011). The research showed that the practice of theorycrafting is particularly prevalent among players engaged in player versus environment activities or raids. This deeper understanding of the game may lead to a higher level of play, making the game more enjoyable for the players and spectators (Hodge et al., 2021; Kokkinakis et al., 2020).

Additionally, in collaborative scenarios such as raids, World of Warcraft players appear to align more closely with the accepted metagame, benefiting their team. This generally accepted metagame often originates from the most analytical and strategic players —the "number crunchers" and "theorycrafters"—and the information then disseminates throughout the community. While Paul (2011) offers valuable insights into the World of Warcraft community's behavior, it also suggests that similar dynamics may be found in other games with sufficient complexity to cultivate a meta. Thus, we apply it here for Dota 2.

Applying the tournament scenario from Figure 2 on a broader scale, it can be seen as a conduit for knowledge transfer and unification. Isolated subcommunities, separated by various barriers, may embrace the overarching meta as the most effective way to play a game. This progression aligns with the metagame life cycle model proposed by Kokkinakis et al. (2021), which unfolds through stages of ignorance, understanding, and stabilization. Figure 3 provides a simplified representation of the metagame cycle process.

Discussion—Synergizing the Meta Ecosystem

We finally bring the proposed model elements together into an ecosystem model to synthesize a representation the full meta context. Here, different individuals, communities, or subcommunities within a game can have different versions or understandings of the meta, as barriers such as geography or skill level cause them to have different versions of meta understanding with one another. Thus, knowledge transfer events allow the meta to streamline once the information has been spread. An argument can be made that even though individuals or more minor subcommunities, such as groups of friends, can engage in theorycrafting and come up with a superior understanding of an individual or set of strategies until that snapshot of knowledge is validated and accepted by the wider community, it does not cause a new iteration of a meta.

Figure 4 shows this overall ecosystem model. Some subcommunities may have variations of the grander accepted meta, such as limitations such as skill level, which may not allow players in lower-ranked brackets to execute more complex gameplay; due to this, variants of the meta may form based on the overarching meta which is shown with similar color variations in the diagram.

The definition of the meta, in general, has moved toward becoming well defined in research as essentially the most

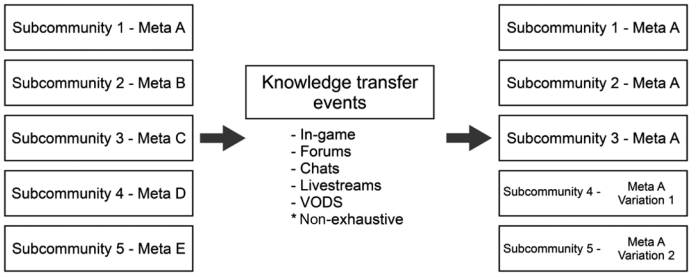

Figure 4 — Metagame propagation through different communities.

optimized set of strategies based on the game and its surrounding structures (Kokkinakis et al., 2021). There are uncertainties on what constitutes a meta, both in terms of metagame and metagaming, and how they propagate and develop over time. We have proposed a theoretical model, with three distinct aspects, that address the meta constitution and how the metagame develops between subcommunities in a game through knowledge transfer events. An argument may also be made that the metagame is not only an optimized set of strategies but a community or subcommunity must also accept the set of strategies to become the meta. While the review is based on practical examples from MOBA games, we believe that the general concepts apply to many esports titles, which is shown through previous works such as Kokkinakis et al. (2021) and Debus (2017).

As a recap of the proposed ecosystemic framework, we propose that the knowledge structure of the meta consists of three main top-level categories: the player–game interface, in-game strategies and resources, and peripheral actions. The components' sublevel categories branching out from them are game-specific, although games within the same genre, such as Dota 2 and League of Legends, can have nodes that represent the same aspect of the meta with minor variations to them. Thus, no two games will have the same nodes unless they are exact copies of each other. Minimetas exist within the overarching knowledge structure, such as the laning meta in MOBA games. These aspects of the wider structure may change and evolve at a different pace than the overall meta, and events that shift a meta, such as updates to a game, may only change certain nodes within the framework.

Players within a community possess their own or the community's version of the proposed knowledge structure that has been accepted as the meta in their respective circles. When these circles mix and there are more versions of the meta in circulation in an environment, players may adopt the meta knowledge that is deemed to be superior to their previous understanding, and thus, the acceptance and utilization of a certain meta knowledge structure propagate through the wider community and become the de facto meta.

Conclusions and Future Work

Games are increasingly persistent, and when persistent, they need to change constantly to keep audiences engaged (Zhong & Xu, 2022), with esports being a prime example. The meta of a game is the system that describes the changes made to a game, the resulting impact on the community of the game, and the resulting behavioral changes of the players in the game (Kokkinakis et al., 2021). A systemic model of game metas thus provides the structure for designing changes, assessing the expected changes to the gaming experience and forecasting, modeling, and evaluating the resulting behavioral changes in the game. Previously, game metas have been underexplored and in practice dealt with in an ad hoc manner. To solve this problem and enable academia and industry to model and evaluate game metas, we present a comprehensive, systemic model of game metas.

It is also important to keep in mind for future studies that persistent games (games as live services) do bring into question potentially undesirable or illicit activities, such as match-fixing or betting (Abarbanel & Johnson, 2019; Brickell, 2017), which may influence the meta in consequential ways. However, this also brings potential for future work and refinement of the model we proposed in this paper.

Identifying the metagame's structure within games sheds light on the evolution of team strategies in those titles. Players and teams can adapt their competitive strategies based on preferred playstyles, while developers may utilize this historical understanding for game enhancements. Certain components of the metagame can be quantified, leading to model development from game telemetry data, useful for research or player training. Recent academic endeavors, such as Pedrassoli Chitayat et al. (2020), have delved into quantifying meta subcomponents, using wards in MOBAs as a primary example. They enhanced standard models to provide a more comprehensive measure of ward effectiveness, integrating metrics like detection of significant enemy items and ward duration. Feedback from top-tier players affirms the model's potential, suggesting an exciting avenue for future research in game data and player behavior.

While preexisting studies have gradually moved toward systematizing meta concepts from initial works, such as works by Donaldson and Debus (Debus, 2017; Donaldson, 2017b), there is a lack of a system that connects these high-level concepts to lower level practical works, such as those on spectator experiences or performance analytics (Demediuk et al., 2021; Pedrassoli Chitayat et al., 2020). Thus, our proposed three-part model serves as an initial attempt to address this gap in knowledge and bring a starting structure to this important topic.

Players and developers can utilize our proposed model to aid in strategy development, and speed up metagame knowledge acquisition, by pinpointing the components that have changed from patch notes. Researchers can use this model as a starting point to study ways to quantify the meta, which may lead to more advanced models that take into account player behavior, and loop back to assist developers in metagame design and players in strategy development. Further, by using game telemetry data size effects of each knowledge transfer medium and temporal aspect of the metagame cycle can be investigated. Thus, we hope that this first attempt to structure this aspect of esport games will act as a catalyst to enable future research on this incredibly important topic.

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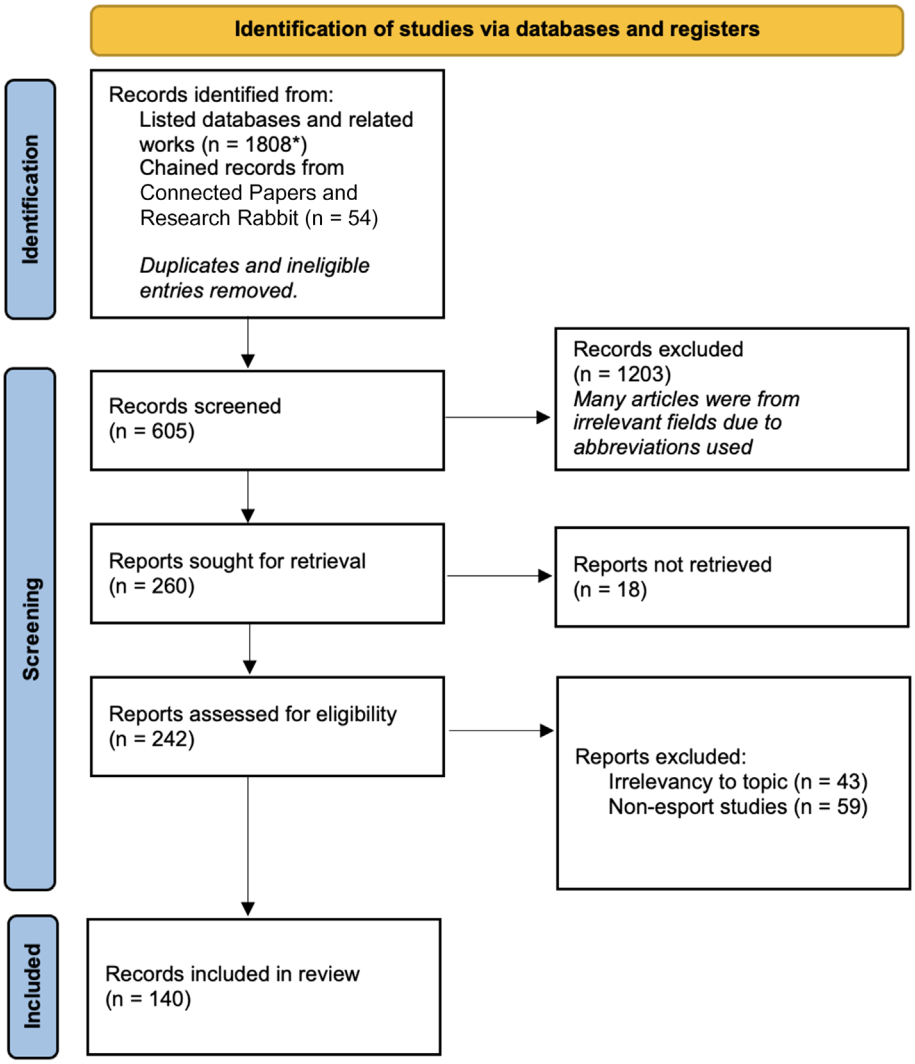
Appendix

A1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses Diagram for Literature Search



B: Corpus of References used for Review

High Level Works Records (Meta Generalisation)

Adinolf, S., & Turkay, S. (2018). *Toxic behaviors in esports games: Player perceptions and coping strategies* [Conference session]. Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts, 365–372. https://doi.org/10.1145/3270316.3271545

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