Analyzing Player Profiles in Collectible Card Games

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ABSTRACT

Collectible Card Games (CCGs) are experiencing a formidable growth in recent years, especially in regard to their digital incarnations. In addition, understanding how players react to the various aspects of those games is of fundamental importance for designers and companies to provide new titles, mechanics, and expansion decks. In particular, comprehension about how players enjoy CCGs play a key role in understanding how these games can be improved and maintained. In this paper, we carried out analyzes on data collected from users in order to figure out player profiles and preferences in this segment. Our experiments are based on multivariate analysis methods applied to the responses collected from an opinion survey. Our experimental results show these are capable tools to explore subtle, non-trivial characteristics of the data. We obtained two clear player profiles and their preferences.

Keywords: Collectible card games, game culture, multivariate analysis.

1 INTRODUCTION

The modern entertainment industry offers games of various styles and formats, ranging from analogue, board, and card games to the digital, computer, console or mobile games. However, it is not an easy task to define what games are and also categorize them [25], as pointed out by Brian Sutton-Smith [29] and Jesse Schell [27].

A significant growth in the Collectible Card Game (CCG) segment can be observed in recent years [13]. According to projections presented by the SuperData Institute[1], revenue incomings totalized about U$ 5.73 billions only in 2017, being U$ 1.4 billions from digital card games. This demonstrates a predominance of physical copies regarding player preference and buying habits. On the other hand, reports for 2018[2] estimate another expansion, especially for the digital market: expected revenues are U$ 1.5 billions specifically for digital titles worldwide.

According to these reports, total player audience for CCGs is estimated to gather around 66 million people. Moreover, there is a trend for this market to grow around 5%, which is quite good considering global crisis and the considerably high numbers of this market. In particular, digital CCGs are expected to generate almost U$2 billions worldwide in 2020. With respect to CCGs, the first title of this genre is still the most popular considering the physical medium [9] [15]. CCGs matches revolve around matches played as a strategic duel in which players explore the options provided in decks built beforehand. In such a duel, players are typically endowed with a fixed number of cards, which are played in turns in order to draw out the opponents' hit points. Of course, this gender experiences constant development of new titles, mechanics, and also hybrid incarnations [26].

Given such a favorable scenario for the development of this game genre, this work aims to analyze data collected from players in order to draw profiles of interest in CCGs. The instrument used to collect data was an online questionnaire, which was made available in some discussion groups on CCGs. This questionnaire combined objective and subjective questions, most of which were using a Likert scale [19] to determine the respondent's opinion more accurately. Subjective questions allowed us to figure out six games which are both well-known and representative from the CCG genre.

Multivariate analysis methods were used as an analysis too since the main objective of this article is to identify discernment between player groups and relationships among the questions that may present interesting results: the correlation between responses to the questions were accessed using Pearson's coefficient; identification of association rules for the frequency of responses; and we also observe the distributions of the data to make inferences.

Based on literature review we present throughout Section 3, as far as we know, this is one of the few academic works following this line of investigation. These are the main contributions of this paper:

- We design and apply a questionnaire especially designed to collect players' opinions regarding CCGs.
- We analyze these data using multivariate methods.
- We identify two player profiles based on preferences and also outline a general player behavior we found in our investigation.

The rest of this work is organized as follows: theoretical background and general definitions are presented in Section 2; related work is discussed in Section 3, highlighting the motivation and importance of carrying out this investigation; Section 4 is devoted to present our research methodology; results are presented in Section 5, so discussion about these are a matter for Section 6; finally, conclusions of this investigation and future research directions are presented in Section 7.

2 THEORETICAL BACKGROUND

This section is devoted to introduce readers to the theoretic aspects that underpin our research. A discussion about games and card games is developed in the first subsection. Once the fundamental terms are defined, we attain our attention to reason about collectible card games.

2.1 Games and Card Games

In his studies, Brian Sutton-Smith [29] summarizes the different understandings that several authors have about playing and games. This author proposes a classification of games based on different perspectives, divided into eight "rhetorics": progress, play, destiny, power, identity, imaginary, self (experience), and frivolity.

The unsuspecting reader may be quite surprised by the difficulty in devising a broadly accepted definition for games [28] [25] [24].

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[1]https://www.alistdaily.com/digital/digital-collectible-card-games-1-4-billion/

[2]https://www.superdataresearch.com/market-data/digital-card-games/

More recently, Maranhão and his collaborators [25] developed a study regarding the definitions of games, coming up with their own definition after analyzing the many other definitions found in literature. These authors conclude that *mechanics* play a core role in games, since this is the element that distinguishes games from other entertainment media. According to Maranhão et al., the very definition of mechanics depends on players recognizing them in order to apply those to actually play the game.

Since there is no unanimity among game professionals about the definition of games, in this work we will adopt the following definition proposed by Jesse Schell [27]: "A game is a problem-solving activity, approached with a playful attitude". We advocate in favor of this definition because it is simple, comprehensive, and easy to understand. In addition, it encompasses a wider range of games than many other definitions found in literature, which frequently displays a dichotomy between analog and electronic games from a research perspective [25]. Consequently, anything that fits Schell's definition and makes use of the digital medium will therefore be considered a digital game. Conversely, anything fitting the aforementioned definition and is not bound to the digital will be considered an analog game. Despite uncertainties about the origins of card games, one of the earliest known records is a Chinese game of chance dating back to the late 13th century[3].

Card games are built on top of clear rules, which define game mechanics. Each player usually draw cards into her "hand" in order to get access to these game mechanics or "moves". It is worthy to mention that such games virtually involve a random pick of cards, thus characterizing a close relationship between this type of game, gambling [17], and the profound mathematical nature [13] behind the flows that matches take until a win or draw condition occurs [27].

Analog games involve manipulation, if any at all, of existing, actual real-world objects. These exist since the ancient Egypt, since evidences dating from more than three thousand years were found corroborating the popularity of a game called Senet among the royal families and the wealthier Egyptian social classes [10]. Regarding analog games, we can cite *card games* as one of the most widely diffused in diverse cultures. Despite any doubts about its origin and how this game genre was spread, it is clear that card games comprise a formidable cultural element, defining how a myriad of people entertain themselves and also, unhappily, lose their money.

2.2 Collectible Card Games

Card games evolved over time, due to the development of cultural and socio-economic foundations that enabled this type of activity to take place, as well as through the innumerable contributions made by enthusiasts from all over the globe. First, we can observe the existence of an internationally recognized standard playing cards deck. Moreover, there are many other card games, with especial attention to the *Collectible Card Games*.

CCGs are also known as Trading Card Games (TCGs). However, the term Collectible Card Games is considered to be more suitable since it does not gives rise to criticism or controversy about a supposed "card trading". According to David-Marshal et al. [12], CCGs originated with "The Base Ball Card Game" introduced by Allegheny Card Company in 1904. This prototype card game features players from the U.S.A.'s National League. All that is surely known about it is that it is comprised by 104 player cards plus 8 team ball cards, since there is no information available regarding the rules of the sole copy found [4].

The CCG format players know of today began with Magic: The Gathering, published by Wizards of the Coast in 1993 [20]. Also known as simply "Magic", this is still the most famous CCG created to date. This game consists of a strategic duel between two players

[3]http://copag.com.br/tudo-sobre-baralhos/origens/

[4]https://boardgamegeek.com/boardgame/37094/base-ball-card-game

Figure 1: Cards from "Magic: The Gathering", which is considered the first modern CCG as we know. Cards represent creatures, resources and actions managed by players. Mechanics are described in the cards themselves.

with *previously* mounted decks containing a minimum of 60 (sixty) cards, in which each player has 20 (twenty) hit points in the standard format, and play on a turn-based schedule. Adaptations allows for more than two players. There are five (5) ways to lose in Magic, the main ones are when a player's hit points reaches 0 (zero) or if a player has no more cards to buy in the deck, which is also called "Grimoire". Cards from Magic are illustrated in Figure 1.

The main approach of the game is that each player has a *part* of the game, consisting of her card deck which is bought in packs containing random cards. Therefore, players have to meet another players in order to play. In addition, each player would have a unique game due to her personalized deck, while being part of a larger game. Finally, another differential found in Magic was the fact of mixing strategy with randomness, which adds to the games replay value (replayability).

In general, the other CCGs share a number of similarities [20]: cards illustrate their function and/or character through art; a turn-based gameplay scheme is adopted; rules and mechanics introduced by each card are usually described in that card; decks are elaborated previously based on some strategy; the cards in the deck are obtained in a random order, by buying packs or trading with other players; in most of these games, the winner is the player that manages to zero her opponents' hit points first. Digital CCGs adopt some resource management system to download cards. Other CCGs also adopt an explicit point system for defining who wins the game: in this case, players who find themselves in a advantageous situation try to finish matches by any means necessary [22].

Figure 2: "Dragonic Overlord Card" by "Cardfight!! Vanguard" (left) and "Triss Merigold" by "Gwent: The Witcher Card Game" (right).

However, there are some particularities from one CCG to another. For example. in *Cardfight !! Vanguard*, published by Bushiroad in 2011[5], players have no hit points but damage points: consequently, a player loses a match with a total of 6 accumulations of damage. Another example is the game Gwent: The Witcher Card Game, published by CD Projekt RED in 2016[6]. Gwent does not use a "power system", that is, differently from other games each card played consumes a "power" resource, almost any card in your hand can be put into play in a turn, giving the sole limitation of playing only one card per turn. Figure 2 displays two cards, being one from each game, evidencing their differences and similarities in terms of the very structure adopted for game cards.

3 Related Work

First of all, we must observe that related work as academic literature which is closely related to our field of investigation is scarce. Most search engines and report none to a few results when using the following terms: (a) *CCG and "player taxonomy"*; (b) *collectible and card and game and player and analysis*; and (c) *collectible and card and game and player and analysis*. Most papers found using variant keyword sets are related to specific applications, especially in the following fields: gambling [1] [17], education [18], business [8], culture [20], health care [6], and psychology [7]. Other works try to automate playtesting in electronic CCGs [15] [22], suggest decks by means of recommendation systems [9], or address customization [16] and pricing issues [21].

In a recent publication [13], Drabik discusses games and artificial intelligence from an economic standpoint. The author observes that the games, especially those played in social or sports disciplines, provide important scenarios for entertainment, education, and specifically polishing the automatic learning methods behind the recent developments in the field of AI. In addition, Drabik points out the the main way a computer can cheat on its human opponents: modern, sophisticated algorithms built on top of statistics and numerical methods can explore virtually all the diversity of large data sets in the search for subtle, unclear or virtually imperceptible patterns.

In fact, Tobias Mahlmann and his collaborators [22] resorted to generic algorithms in order to explore Dominon's sets of cards for balancing purposes. These authors compared their method against three intelligent agents designed to play on different skill levels, so their experimentations were based on simulation and automatic learning techniques which were proven capable to determine that there are cards in the game that endow it with balancing. Such a profound observation states that such balancing exists independently of playing style, a conclusion that could not be obtained with ease or so readily by means of simple human experimentation.

In their turn, Feitosa et al. [14] highlight the growth of e-Sports and the importance of understanding gameplay for designing, training, and developing game titles. These authors advocate that games provide a great amount of complex data that lack a proper presentation for audiences get a glimpse of understandable information. In fact, a meaningful interpretation plays a key role for game designers to understand how their games actually work, so visualization tools may provide valuable hints for balancing, designing new mechanics, content generation, and even preventing undesired design errors such as game-breaking mechanics [31]. Starting from such arguably valid hypothesis, these authors proposed a proposed a comprehensive visualization framework for building game data visualization for the Web.

Bartle [3] resorts to visualizations in order to explain his well-known player taxonomy. Even though Bartle has developed his taxonomy from a long and fervent discussion with a group of senior players about what players are looking for in a MUD, it is safe enough to say that a similar summarization could be achieved nowadays using modern natural language automatic processing techniques [30]. However, it is worthy to mention that (a) Bartle proposed his classification based on developments and (b) people participating in the debate presented a certain level of acceptance of the conclusions presented by Bartle. We can also affirm that data analysis and exploratory visualization techniques could also contribute to Bartle's effort in reaching to the same conclusions.

The papers hereby listed shed light on how important it is to analyze the games. Moreover, it becomes clear that this is an eminently complex phenomenon to be studied, being worthy of tools to match this challenge. So, we conclude that research effort is necessary for analyzing CCG players in order to come up with profiles and other insights useful for building an understanding of these pivotal actors, thus contributing to developing more compelling, audience-aware game titles. Based on the discussion presented by analyzing the existing literature, in addition to the lack of material, we advocate that this paper presents an original contribution to the field.

4 Methodology

The investigation reported in this paper was developed resorting to a series of scientific procedures. Throughout this section, we describe our methodological choices in the sense of gathering a collection of data that represent the opinions of CCG players, so this dataset can be scrutinized from a multivariate analysis standpoint [23].

4.1 Survey Design

We propose a questionnaire survey comprised by ten questions. Respondents express their opinions using the Likert five point scale [19] whenever it is applicable. This scale is well known in literature as it helps people to express their attitudes and opinions when they are confronted with affirmations. In particular, respondents can tell they neither agree or disagree with a given statement, thus proving data enabling analysis methods to extract more subtle variations in opinions than simple yes or no responses could provide. Responses are usually ordered from total agreement to total disagreement, or vice-versa, so results provide insights on how players react to aspects found in the chosen game titles [4] [5].

Moreover, responses in the adopted five point scale are designed to aid users to understand more clearly the agreement levels each response to a given question expresses. We do so by adding suggestive affirmations after the level of agreement for each response. In addition, we also carefully checked the accuracy of affirmations and how statements are understood by the target audience, thus resorting to a more informal writing style.

These are the questions included in the survey:

1. *How long have you played CCGs?* I dont know, I played a while ago but I do not play nowadays; A few days; A few weeks; A few months; A few years.

2. *With regard to CCGs you consider yourself...* An extremely casual player, I only play with my friends; A casual player, I play with any person; Amateur player, play a lot and against any player, but I do not participate in tournaments; Semi-professional player, sometimes I participate in tournaments; Professional player, I participate in big tournaments.

3. *How often do you read the game manual?* Just once, since I prefer to learn by playing the game; A few times, just when I have doubt; Some times, I like to study the game. Many times, since I usually have many doubts; Always, I have every rule memorized.

4. *With regard to decks in gameplay, you prefer...* Playing using fun decks, even if those are not good ones; Playing using interesting decks that, despite not being the best ones, stand a

[5] https://en.cf-vanguard.com/

[6] https://www.playgwent.com/

chance to win; Using a good deck, but only when it is fun to play; Playing using the best decks, but only those fitting my playstyle; Playing using the best deck, even it is not fun.

5. *With regard to game mechanics, you prefer...* Simple and easy to learn mechanics; Easy to learn, but allowing for complex strategies to be derived; Moderately simple mechanics, easy to learn but who values training and skill; Complex, who values skill, but with simple basic mechanics; Complex mechanics, which require players' skill to their fullest.

6. *How often do you look for the story (lore) of CCGs?* Virtually never, because what really matters are the mechanics and the strategies; A few times, but I really like mechanics; Some times, to know about protagonists and memes; Many times, since I like to know all characters and their relationships; Always, since I like to immerse myself to the fullest into the game world.

7. *With regard to deck building, you prefer...* Build my own deck, even if it is not the best; Starting from a base deck, make modifications to it in order to fit my playstyle; Build a well-known, good deck and just make a few modifications for adapting it to my card set; Build the best deck for my playstyle, but also adding a few strategic, tech cards; Build the best decks in the game, copying from pro players or specialized websites.

8. *How often do you usually follow the competition of your favorite CCG?* I have no interest in competitive play; A few times, just national tournaments; Often, almost all big tournaments; Very often, I watch all big tournaments; Always, I watch all professional tournaments;

9. *How much do you think luck should influence in a CCG?* The more unpredictable, the better; A lot, I like to be surprised; Moderate, the game can be unpredictable as long as this does not disrupt the strategies chosen by players; A little, allowing to play while it does not affect outcomes; The less unpredictable, the better.

10. *How much do you usually spend on a CCG you like?* I just acquire the basic card set; A little, when there is an interesting expansion; Moderate, some packs whenever there is a new expansion; A lot, many packs for each expansion and/or buy individual cards, because I like to have the best cards; I buy until I have all cards.

On the other hand, we also added two subjective questions about player experience and preferences considering CCGs:

- *What is your preferred CCGs?* Respondents were free to inform any game. However, for the sake of analysis, we considered only respondents who choose one of the alternatives from the six aforementioned CCGs.

- *Which CCGs have you tried playing?* Respondents may provide multiple alternatives in this case.

4.2 Collecting Opinions

We did not adopt initial criteria for exclusion or inclusion of participants due to focus on CCG of groups in which the form was made available. In addition, there was also no resistance on the part of the members to respond to the questionnaire. Some of the participants even displayed a certain excitement at the time. A total of 272 responses were obtained regarding the six games chosen to be considered in this investigation, on which an initial analysis was made to identify preliminary information about the players.

5 Results

The data collected according to the methodology described in the previous section were analyzed and visualized, as we show later in this section. It should be noted that the Google Forms was the tool of choice in the implementation of this task, which provided agility and convenience in the form's dissemination and in the storage of responses, respectively.

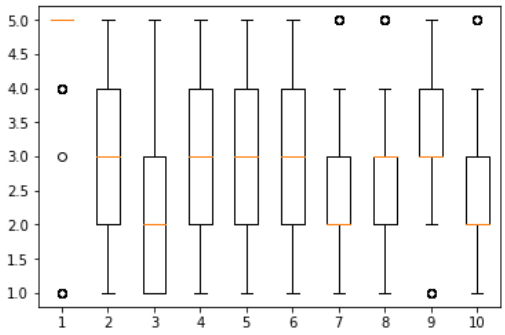

Figure 3: Player responses for each question using a box plot. This kind of visualization allow us to identify medians, quartiles, and also outliers.

After an initial analysis, the present study was directed to experiment standard statistical strategies in order to perceive correlations between the questions of the form. Figure 3 is a boxplot representing the distribution of responses for all ten objective questions in the opinion survey, where objective values were first converted to a five point scale. We can easily observe in this plot that the first question resulted in high values since the median is set on 5, which indicates that most respondents are experienced players. In addition, this also strongly suggests that CCGs usually attract players' attention with time, which partially corroborates the projections presented by market analysis companies.

5.1 Player Bases

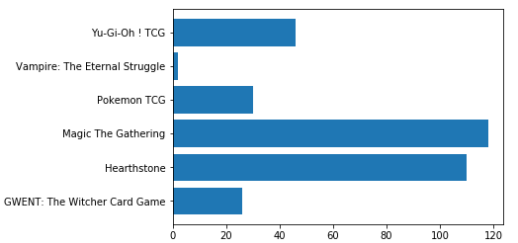

Figure 4: Favorite CCG according to reported player preferences. Most players show appreciation for Magic and Hearthstone. Other titles had less player, but in general a similar audiences who preferred them, except for *Vampire: The Eternal Struggle*.

Figure 4 depicts the distribution of players given their preferences on a specific CCG title. It is clear that Hearthstone and Magic have significantly bigger player bases. Hearthstone was well received by players, and its competitive scene are facts that easily explain the popularity of this recent, digital title. On the other hand, Magic, as the pioneering title of modern CCGs also shows a bigger bigger community which was built throughout decades and many expansions.

Interestingly, the distribution of these CCGs tiles according to the number of players who experienced them reinforces our percep-

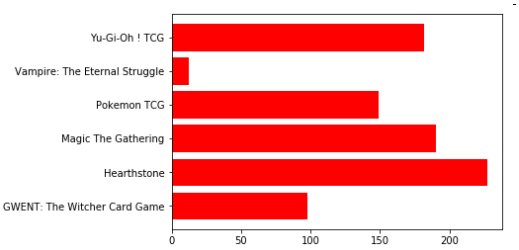

Figure 5: Number of players experimenting each game title analyzed.

tion that there are a large number of experienced players taking part as respondents, given the following numbers: 227 experimented *Hearthstone*; *Magic: The Gathering* was experienced by 190 players; *Yu-Gi-Oh ! TCG* was reported by 182 respondents; 149 played *Pokémon TCG*; 98 players claimed to have experienced *GWENT: The Witcher Card Game*; and just 12 players tried *Vampire: The Eternal Struggle*.

It can be seen in the graphic of the Figure 5, colored in red below, that a considerable number of players experimented playing *Hearthstone*, *Magic*, and *Yu-Gi-Oh*. In particular, this visualization also corroborates the extents of player bases for *Yu-Gi-Oh*, *Pokémon* and *GWENT*, since these bars are proportional in both charts. Finally, only a few players tried *Vampire*, but this also suggests that this particular CCG was effective in terms of captivating the audience.

5.2 General Profile

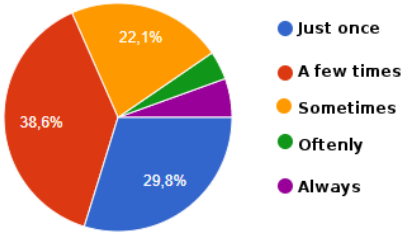

Figure 6: How often respondents read the manual for understanding game rules.

An initial analysis of the data already allowed to infer some information about the general player profile. Asked about how often they seek the manual, 69.4% of respondents replied that they returned little to the manual after the first reading (see Figure 6), demonstrating a certain disinterest or lack of need of most players in return to the basics of the game. This suggests players tend to prefer learning the game by experience. In addition, it is safe to also assume that these CCG titles, in general, display a clear game design. Moreover, having mechanics printed in cards also helps players in memorizing the game rules.

A similar trend could be observed in another question, in which players responded on how much they like to customize their decks. 65.4% of players responded that they want to make significant changes to the deck and not simply copying it from other players, portals, or guides. This shows that the general audience seeks a compromise between competitiveness and fun (Figure 7). In turn, this demonstrates a general interest of players in using their own strategies and feel represented within the very gameplay of CCGs.

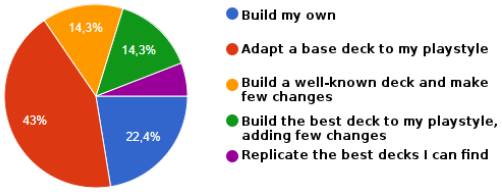

Figure 7: Responses regarding deck customization.

5.3 Motivational Aspects

This initial analysis shows the degree of involvement that CCGs have with their players. For the sake of completeness in our investigation, we also felt the need to also assess the factors that drive the public away from these games. When asked why they would stop playing a CCG, players mostly replied that: price and a toxic community would be the main reasons. In addition, players frequently resorted to the term "pay to win", used in games, which gives the impression that investing money gives the player extra advantages and can not be achieved by individual effort. From this evidence, we can infer that players are willing to spend their money on playing CCGs, but, if that "investment" factor influences the outcomes of matches, it can cause a significant disapproval. In addition, it is clear that interaction between players plays a key role in this segment, thus making the community an important point for the permanence or abandonment of a player.

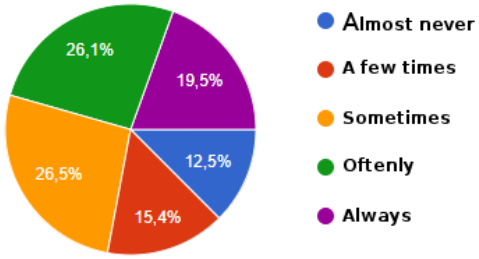

Figure 8: Responses regarding narrative. At right, from top to bottom, labels represent players: who focus on mechanics or strategies; who focus on protagonists and memes; who want to know about characters and their relationships; who immerse themselves to the fullest into the game universe. Despite less than half players reported a deep interest in narrative, this portion of the public is still significant for product design purposes.

Analyzing data on about what causes them to start playing a new CCG, players also displayed a general profile. When questioned about how often they look for the narrative of a CCG title, 45.6 % of respondents claimed to have great interest in the narrative and setting of the game, and 26.5 % responded moderately (Figure 8). Confirming that players care about the narrative context of the game and want to feel immersed in their world. Game art and theme are reportedly important factors in attracting new players, evidencing the respondents' interest in the aesthetic and thematic part of the game must be properly addressed in these products, as already pointed out by Filho et al. in their study in character design processes [11]. Unfortunately, we are obliged to agree with these authors that there is a lack of scientific material in such an important field to the gaming industry.

CCGs are designed with *replayability* in mind. That being said, random aspects are used in these games to endow them with a

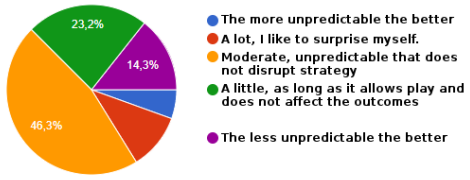

Figure 9: Distribution of preferences on chance mechanics [27].

greater diversity of situations and to allow match twists and comebacks, thus making the game deeper, and less deterministic. In addition, this also helps balancing and making games more suitable for beginners [13] [22]. Jesse Schell [27] refer to such "randomness" aspects of games as *Chance Mechanics*, and also points out that this is a delicate aspect of games. When asked about their references on the level of randomness in CCGs, 46.3% of the players responded that they like a moderate level and 37.5 % prefer a very low level (Figure 9). Demonstrating a preference of the players for the strategy and that chance should only be used to insert unpredictability, but not in a decisive way, i.e., this strongly suggests that players want their skills to be acknowledged as a key factor for winning matches.

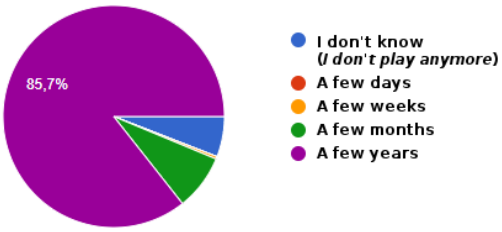

Figure 10: Distribution of time.

Regarding the time being CCG players, 85.7% of the respondents claimed that they played for a few years ago. This distribution shows a considerable loyalty of the players to the segment (see Figure 10), as we already mentioned based on the boxplot in Figure 3. It is safe to assume that such involvement period with CCGs gives time for players to develop a deeper knowledge about the games the play, to understand strategies and also to come up with their own strategies.

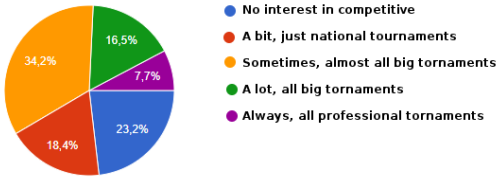

Figure 11: Distribution of players' opinions on following the competitive events of CCGs.

When asked about how they studied the game, most players replied that they consume third-party content such as online broadcasts, videos, specialized websites, and so on. In addition, 58.4% of players claimed to follow the competitive landscape of the CCGs they play (Figure 11), reinforcing players' interest in an active community and also showing a general intent in attending to competitive events.

5.4 Multivariate Analysis

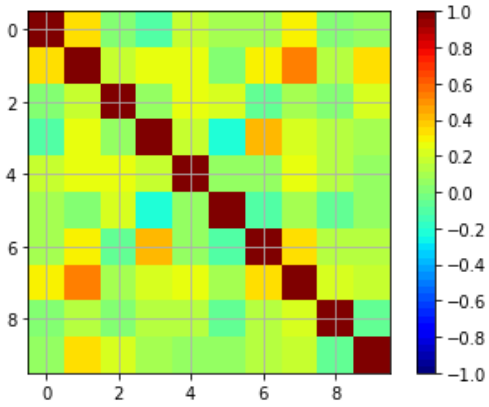

Figure 12: Correlation of player responses for each question. In this chart, questions were enumerated from 0 to 9, by using a bias equal to −1.

Our analysis starts from a correlation matrix between responses for all questions. As depicted by Figure 12, the correlation between these ten variables varies from moderate to high. Moderate correlation is clearly visible from the dominance of green and yellow blocks in the chart, while the few blocks in orange denote three important correlations: between questions 2 and 7; between questions 2 and 10; and between questions 4 and 6. This suggests that the opinions players have about themselves are closely related to the way decks are built and the corresponding buying habits. Moreover, there is also a relationship between the level of interest in the narrative and how players' choose their decks for performance and/or fun purposes.

We also explored association rule learning between responses [2], since this technique can determine interesting implications between variables similar to causality based on frequency. In short, by using this method, we adopt two metrics for determining relationships between variables, which are support and confidence, respectively. Given two variables, *support* represents a frequency of how these two items occurs together in all observations in a dataset. *Confidence*, in its turn, indicates how often an implication between these two occurrences can be observed, *i.e.*, how "correct" that rule can be assumed to be in the observed dataset. As a result, players are essentially attracted to the narrative when they are influenced by aesthetics, i.e., the aesthetic aspect that implies the narrative with a confidence of 0.78. However, the opposite is not true given a low confidence of 0.55.

This same type of evaluation was used to study the implication among the most cited games during data collection. We excluded *Vampire* from this experiment, given this title's reduced player base. The rules of association derived between the other five games showed that many players display a relationship between playing *Yu-Gi-Oh*, *Pokémon*, and *Hearthstone*, given the high support values obtained for these rules and the confidences values around 80%. As illustrated by Figure 12, despite there is no correlation between questions themselves, some variables share support around 0.5.

6 Discussion

There is a high frequency in which players read the manual and have followed the competition, the history of the game and the pref-

erences of mechanics. All associations have reasonably higher relevance. This relationship is emphasized by the importance of these aspects in a complex game of *Vampire: The Eternal Struggle*, a title that was analyzed separately.

In their turn, players who have reported to play only one or two games have slightly different distributions from the others. Players who are more focused, or who have been more focused on the assertions that they follow tournaments are related to the mechanics, type of deck, and how the player considers himself versus his games. All these relationships present correlation around 0.5. Correlations between 0.6 and 0.7 involve decking expenses.

Finally, the favorite games were analyzed from a perspective of distance between two populations [23]. We adopted two metrics: Penrose distance and Mahalanobis distance. In general terms, these metrics consider both the variations intrinsic to each population and the variations between populations. Penrose distance weights internal variation using the inverse of the covariance between populations for all variables. In its turn, Mahalanobis distance is quite more complex, and weights each pair of variables by the inverse of the covariance between those variables.

Considering these two definitions for distance measures between sets, and the presence of experienced players in the survey, most inferences about the types of games are difficult to obtain because the profiles are mixed. In contrast, we have respondents with a good understanding of the CCG market. A series of observations obtained from the correlation and distance matrices for each set of players is presented below:

- Yu-Gi-Oh players who are involved in the competitive scenario tend to deprive themselves from having fun playing the game, since these players aim victory as their main goal. This is observed by questions 2 and 7 having moderately high correlation of 0.72, as aforementioned. This strongly suggests that players' goals affects more experienced players with greater ease. This is also reflected in their expenses with the game, since the ratio of questions 2 and 10 have moderate correlation 0.5.

- Magic players reported a similar behavior to that of the Yu-Gi-Oh. However, these relationships are much weaker, ranging from 0.4 to 0.5. This can be explained, to a certain extent, by the sedimentation of a large, mature community.

- The public of the other games presents a more moderate behavior in this aspect, since these respondents did not display a perceivable tendency that stands out to the other games.

7 Concluding Remarks

In this paper we address the problem of analyzing CCG players for obtaining clear profiles. Six representative game titles were selected in order to endow this investigation with a broader interpretation under the light of different games with overlapping audiences. We designed and then applied an objective opinion survey built on top of the Likert scale [19] for qualitative data, whose values provided by 272 respondents were scrutinized using multivariate analysis methods.

Our results suggest that there exist common preferences independently of a specific CCG title. In particular, we found evidence that players share similar general behavior on buying habits, deck choices, and how casual players tend to enjoy CCGs by exploring titles as medium to express themselves in the very act of gameplay. Such strong cultural traits we observed indicate that CCGs most likely have an even greater audience to captivate as both products and game gender.

On the other hand, we could also identify two distinct broader groups. The first group is formed by players which experience few titles and tend to focus their attention and expenses in one or two CCGs. These could be considered to be hardcore or engaged players who give up the intrinsic value of having fun in the pursuit of victory. The other group, in its turn, gathers players who played more game titles, so, therefore, these tend to dilute their financial and temporal resources among the various titles they play. Players in this second group can be considered to be similar to explorers in the Bartle's taxonomy [3].

Future works starting from this paper include deeper analysis based on open, textual responses. Such analysis can complement ours in in the sense of confirming or refuting our results. Moreover, we believe other relationships could be found using open answers and natural language processing techniques. Finally, gameplay data and demographic information about players can also provide insightful data crossing for a richer analysis, or even give rise to new analyses from different standpoints.

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