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THE IMPACT OF IN-GAME ADVERTISING ON BRAND RECALL AND RECOGNITION WITHIN NON-LINEAR VIDEO GAMES

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Abstract

Video games have changed throughout the years and new game releases have shown a shift to more non-linear video games, where players are free to choose what to do without the game forcing them to make a specific choice. This can change the effectiveness of advertisements. Recall and recognition are two variables that have been studied over the past years and are crucial to measure the successfulness in an advertisement, including advertisements integrated in a game. In-game advertising has been studied recently by researchers, with most analyzing the factors that impact recall and recognition levels. However, most studies tend to rely on extremely controlled scenarios where player action and freedom are not allowed. The purpose of this study is to test recall and recognition levels in a non-linear multiplayer video game where players can freely roam the map, almost depicting a real-life scenario. Results suggested that area population and consumer brand involvement are significant as predictors of brand recall and recognition, but advertisement size seemed insignificant. Using decision trees, individual player factors proved to have the same importance (sometimes more) as area population and involvement for predicting recall and recognition. Repetition was the most important predictor, which was measured by the number of times a player saw the advertisement fully on screen. The results are in line with previous research, but in a non-linear video game context. Businesses should be take area population into consideration when placing advertisements in games but should also think about player characteristics.

Key words: in-game advertising, area population, recall, recognition

Resumo

Os videojogos têm sofrido alterações com o tempo e os novos lançamentos mostram uma mudança para videojogos não-lineares, ondes os jogadores têm mais liberdade de escolha no jogo. Isto pode mudar a eficácia dos anúncios no jogo. As variáveis recordação e reconhecimento têm sido estudadas durante anos e são cruciais para medir o sucesso de um anúncio, incluindo anúncios em jogos. Publicidade in-game é um tópico recentemente relevante para investigadores e muitos estudam o que impacta os níveis de recordação e reconhecimento. Contudo, muitos dos estudos tendem a contar com senários extremamente controlados em que a ação e liberdade do jogador são desautorizadas. O objetivo deste estudo é testar os níveis de recordação e reconhecimento num videojogo multiplayer não-linear onde os jogadores são livres de caminhar pelo mapa. Os nossos resultados sugerem que a população da área e o envolvimento do consumidor na marca são variáveis significantes na previsão dos níveis de recordação e reconhecimento, mas o tamanho do anúncio mostrou-se insignificante. Com árvores de decisão, os fatores individuais do jogador pareceram ser preditores tão ou mais importantes que a população da área e o envolvimento do consumidor na marca. Repetição foi o preditor mais importante, tendo sido medida pelo número de vezes um anúncio apareceu completamente no ecrã do jogador. Os nossos resultados estão de acordo com outros estudos, mas num contexto de jogo não-linear. A população da área deve ser considerada por empresas se usarem anúncios em jogos, tendo também em consideração as características dos jogadores.

Palavras-chave: publicidade in-game, população da área, recordação, reconhecimento

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List of Abbreviations

ESA – Entertainment Software Association

IGA – In-Game Advertising

MMOG – Massively Multiplayer Online Game

MMORPG – Massively Multiplayer Online Roleplaying Game

CBE – Consumer Brand Engagement

ROC – Receiver operating characteristic

1. Introduction

The video game industry can be characterized by its compelling success over the last years, having experienced an enormous growth, growing annually by between 10% and 15%, over a 25-year period (Zackariasson and Wilson, 2010). According to ESA (2017), in the US, there was an increase in video game content spending, from 17.5 billion dollars in 2010 to 24.5 billion dollars in 2016. In total, consumer spend on the video game industry was 30.4 billion dollars in 2016. Playing video games has become a very common hobby for a lot of people, it is not just a pastime for male teens and young adults in their 20s, there is a market for a wide variety of ages and genders (Mena and Cookman, 2017). It is an urban phenomenon, much like traditional art forms, and it demonstrates complementary relationships with other cultural goods or artistic goods (Borowiecki and Prieto-Rodriguez, 2015). Furthermore, the more enthusiastic gamers establish and/or join online gaming communities, where they socialize with other players with similar interests and create bonding experiences. In today's world, human interaction is changing to accommodate the growth of online social networks. Human relationships are being migrated to a virtual environment, creating various online communities that connect people with each other (Tiago and Veríssimo, 2014) and players immerse themselves in these virtual worlds (Williams, Hendricks and Winkler, 2008). According to ESA (2017), 53% of the most frequent gamers play multiplayer games in the US, further supplementing the growth of online games.

Due to this growing importance, using video games as a form of advertising is increasing in popularity, although the prime target is still young audiences (Peters and Leshner, 2013). In-game advertising (IGA) is a captivating way of allowing marketers to expose their brands to video game consumers. However, most of the studies regarding IGA or product placement in video games have been conducted in very linear video game scenarios, where the player is forced to follow certain paths, like in a racing game for example (Herrewijn and Poels, 2014; Ghosh, 2016; Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017). The present study confirms the findings of previous studies regarding brand prominence, brand recall and brand recognition but in a non-linear video game where players are allowed to make their own choices and freely roam the in-game environment, mimicking a real-life scenario. This study highlights and confirms the importance of area population and brand involvement as recall and recognition predictors for advertisements in non-linear video games, while offering potential future research topics.

This study starts by reviewing previous research regarding video games, the use of advertisements in video games and concepts related to how people process and retain information, taking into consideration how certain variables influence this process. After taking this information into account, a research model was created and tested using the data from the experiment, with several hypotheses connected to it. After analysing this data, this study discusses the business benefits that arise from the results and presents some future research challenges.

2. Literature Review and Conceptual Framework

2.1. A Brief Introduction to the Video Game Industry

Video games have been around for a long time, but rarely have we seen a concrete definition of what a video game is. Ozuem, Borreli and Lancaster (2017) define video games as an umbrella term that describes a category of entertainment mass media. There are several types of games, which can be played on mobiles, personal computers, consoles and portable consoles, referred to as computer and console games. Both terms are used interchangeably because "*both cover the notion of participation in an activity for a source of pleasure that gives enjoyment where key structural elements such as rules, challenge and interaction engage players*" (Ozuem, Borreli and Lancaster, 2017: 77). When it comes to their characteristics, video games can possess linear qualities regarding gameplay, storytelling, amongst other aspects. Dille and Platten (2007) explain these concepts of linearity in video games. In linear paths, players are given no choice as to what to do in the story, but this makes it more writer-friendly. In contrast, a nonlinear path (or story), it is completely up to the player to decide on how to tackle the game. Related to this nonlinear approach is the idea of a free-flow game, which effectively refers to an open world design, where players' objective/adventure is to do whatever they decide to do in the world, with no cinematics or breaks in the story.

The video game industry has been growing for some time now, but its growth is not the only remarkable attribute. Video games are also characterized by their high degree of innovation and dynamics (Marchand and Hennig-Thurau, 2013). Gaming can take place within interactive networks and on various mobile devices, such as smartphones and tablets. It can merge with other entertainment industries and offer hybrid experiences (e.g., the Spider-man franchise having video games). In some cases, players can even earn money from e-sports, which are carried out in front of crowds, on live TV and livestreams. The industry has gone through a lot of change. Zackariasson and Wilson (2010) discussed the major paradigm shifts in the video game industry and summarized the most important topics with the following table:

No.	Development	Impact	Nature of shift	Change in competition and competitiveness	Characterization
1	Entry of video games into arcade sector	Shift from pinball to electronic entertainment	Major – changed way segments looked at entertainment	Rapid rise of new entrants. Established firms faced change or decline	Initiation of a sector in the entertainment industry
2	Development of home cartridge	Shift from arcade to home and eventually hand- held	Business approach in taking advantage of available technology	Similar rise of new entrants with eventual shake-out	Could be seen as an industry life cycle change
3	Entry of independent game developers – publishers	Changed industry structure, but increased market size	Major within the industry Shift	Shook power of integrated developer-to-platform firms	Eventually set up co-opetition presently effective
4	Development of MMOGs	Changed way games were played. Emphasized computer nature	Shift in both distribution and payment	Sophistication helped some firms, hurt others. Big impact in far east	Really an industry life cycle change

Source: Zackariasson and Wilson, 2010

Table 1 - Paradigm shifts and changes in the video game industry

The last video game generation is of high significance to the current study. The development of MMOGs (massively multiplayer online games) gave way to more social aspects to be considered in video games, to the point where massively multiplayer online social games were created (e.g., Second Life), where focus is on socialization instead of objective-based gameplay (Lebres *et al*., 2018).

The fact that more video games like these are being made, shows that non-linear games are growing in popularity, since players want to have freedom when it comes to in-game choices and paths. Besides the growing importance of social aspects in video games, the authors (Zackariasson and Wilson, 2010) mention that the gap between video games and other entertainment fields has been removed, whereas they now have almost the same (if not more) importance than other entertainment fields such as sports and movies. This increases the appeal for marketers to look at videos games as possible media for advertising.

2.2. In-Game Advertising

Using video games as a platform for advertising and communication strategies is not a new concept, it has been used for decades by many companies. FIFA International Soccer, the first FIFA game released by EA Sports in 1993, had small billboards in the game with the Adidas logo on them, replicating the looks of an actual stadium but, more importantly, advertising the brand in-game. This example shows the use of in-game advertising in a congruous way, which leads to a better acceptance of the adverts by the players. However, studies show that using awfully incongruent in-game advertising can upset players due to the lack of immersion (Lewis and Porter, 2010).

Product placement can be compared with in-game advertising due to their similarities. Currently, defining product placement can be complicated because a lot authors have different definitions. The definition has changed in the past two decades, with the emergence of 15 new definitions (Chan, 2012). One of these definitions, which is one of the most recent ones, explains that product placement "*involves attempts to expose consumers to brands by embedding them into outlets not typically considered advertising terrain*" (Wei, Fischer and Main, 2008, p. 35). In this sense, video games can be considered as an unusual environment, therefore, by placing brands in the game, it is considered product placement. Although it is seen as product placement, in-game advertising has a special characteristic, which is the ability to make consumers interact with the brand, not just be exposed by it (Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017). Furthermore, it is common for people to engage in casual entertainment, allowing games to be powerful intrinsic motivation triggers. This can lead to people interacting with real or virtual objects that carry advertising material, which allows data gathering related to this interaction (Oliveira *et al.*, 2014).

Regarding the type of data that can be gathered, previous studies of in-game advertising looked at a variety of variables that effect consumers' memory. Some examples of these variables are game difficulty (Hwang *et al.*, 2017), player experiences (Herrewijn and Poels, 2013), brand familiarity, repetition (Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017), game control (Herrewijn and Poels, 2014) and brand congruity (Peters and Leshner, 2013). Constructs like brand recall and recognition have also been discussed, however most were done so using a linear and short video game (Herrewijn and Poels, 2013; Herrewijn and Poels, 2014; Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017). The type of game has also been considered a peculiar topic of research, especially if it is a multiplayer game. In these

types of video games, where social interactions among players are allowed/encouraged, it has been considered interesting to study the impacts of these interactions and how they impact advertising outcomes (Terlutter and Capella, 2013). The location of brand messages in a game, referred as proximity by the authors, was studied as well and it was shown that, focal brands (brands that were placed in the centre of the action in the game) received a higher recognition than peripheral brands (brands that were placed outside the main field of visual focus), in most cases (Lee and Faber, 2007). This study was conducted in an online video game, however, like in most cases, it was tested using a linear racing game. Nevertheless, some studies have been conducted in a non-linear multiplayer video game, one in particular had brand congruity as the main topic of research. In this study, results showed that, when it comes to game genre, players are more welcoming of ads in racing and sports games, since advertisements usually fit the environment and do not impact immersion (Lewis and Porter, 2010).

2.3. The Limited Capacity Model of Mediated Message Processing

To better understand how people process and retain information, this study will take a look at the Limited Capacity Model of Mediated Message Processing, which explains how television viewers processed television messages (Lang, 2000). This model starts by explaining two key features of the average person. The first one being that the average person is an information processor and the second one being that person's ability to process information is limited. Processing information is limited because, once people have been exposed to a certain message, they should automatically move the message into the sensory store (which holds some much information that people cannot be aware of it or attend to it). Afterwards, only a few selected parts of information will be moved to short-term memory, for more processing. The rest of the information that was not picked will be lost and replaced with other information (Lang and Basil, 1998).

The author (Lang, 2000) takes into consideration three major subprocesses of information processing: encoding, storage and retrieval. Encoding occurs when a person takes the message out of the environment into their brain. Afterwards, storage takes place, where the newly encoded information is linked to previously encoded information, which can also be memories. Finally, the retrieval subprocess goes into motion, where the person brings back a stored mental representation that is related to the specific message/scenario. It is important to note that the encoding process is the first responsible for determining which bits of information will undergo change, until mental representations are created. The bits of information are selected by automatic (unintentional) and controlled (intentional) processes. Controlled processes are related to the person's goals while the automatic processes are related to the stimulus. Regarding these automatic processes, the model takes into account that, when people process information, they allocate most of their resources to the primary task and the rest to the secondary tasks. This is especially important for in-game advertising since, when playing video games, players are often focusing in playing the game (primary task) and they do not pay as much attention to the environment and the possible advertisements within the game (secondary task), making it harder for players to remember them (Lee and Faber, 2007; Grigorovici and Constantin, 2004). In a non-linear video game, it is fair to assume that this still applies, but in a larger scale. In an open world game, players can explore a large world in numerous ways that they themselves dictate (Harris, 2007). With a much larger number of choices to think about, it

is safe to assume that players will be even more focused in the gameplay aspect rather than looking at advertisements in the environment.

2.4. Brand Recall and Recognition

Keller (1993) defines brand recall as the consumers' ability to retrieve the brand when given a certain bit of information as a cue (product category, the needs fulfilled by the category, amongst others). In other words, brand recall occurs when consumers are able to successfully generate the brand from memory. Brand recognition, on the other hand, is the consumers' ability to confirm prior exposure to the brand when given the brand as a cue. In other words, brand recognition occurs when consumers successfully identify the brand as having been seen or heard. The performance of both recall and recognition are what Keller calls Brand Awareness. When evaluating the effectiveness of promotional messages, recall and recognition are two very common variables that are measured to evaluate the success of a message. These two are often used together and they are related to each other. Regarding other literature, some authors described recall as a two-stage process comprising retrieval and familiarity, while recognition is comprised solely of familiarity (Davtyan, Stewart and Cunningham, 2016). It is also important to mention that brand recall and recognition are linked to explicit memory rather than implicit memory. Explicit memory requires intentional retrieval of specific information, while implicit memory can occur incidentally or without awareness (Vakil, Wasserman and Tibon, 2018). Some authors consider measuring explicit memory less effective in explaining memory for brands placed in video games (Grigorovici and Constantin, 2004; Choi, Lee and Li, 2013), however it does not mean that they are useless.

Like previously mentioned, a vast number of authors have looked at recall and recognition in their studies and several conclusions have been grasped. As an example, when playing video games, people remember familiar brands in the game more easily than unfamiliar ones and repetition seems to benefit both cases equally (Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017). More importantly, regarding brand location, studies show that focal placements lead to a higher brand recall and recognition sensitivity when compared with peripheral placements (Lee and Faber, 2007).

2.5. Brand Location and Size

When playing video games, the game environment and atmosphere is crucial for gamers' information processing (Hwang *et al*., 2017). Knowing that players' processing capability is limited, marketers and game developers must understand that numerous factors can affect how effective in-game advertising will be in influencing players' memories of a brand. One of these factors is the location where we place the brand name in the game, which is referred as proximity like previously mentioned (Lee and Faber, 2007). Brand names can either have a focal placement, where they show up in the centre of the gameplay, or a peripheral placement, which is outside the main field of visual focus. In most linear games, this is relatively easy to distinguish, since players are forced to follow a specific path (like a racing track, for example) and developers know where on the screen players are more focused on. However, in non-linear games, players often take different paths, especially in open world or sandbox games (Harris, 2007), so it is harder to tell which spots on the screen players are more focused on. It is, however, possible to check which areas on the game map players use more often. Knowing this, this research attempts to test how brand location effects brand recall and recognition, by placing billboards with ads in game areas where players often pass by and in less popular game areas. Regarding the less popular game areas, these areas are not completely deserted from players, they are still used and explored to some extent, but not as much as the other more popular areas. An example of a commonly populated area in most multiplayer video games is the "spawn area", where players first show up when they go in-game. In an MMORPG (massively multiplayer online role-playing game), most major cities within the game are also highly populated areas, since players usually use these areas to access shops, do trading, use various methods of transportation, amongst other things. Knowing all of this, following hypotheses were purposed:

H1 **Area population positively influences brand recall for advertisements placed in non-linear multiplayer video games.**

H2 **Area population positively influences brand recognition for advertisements placed in non-linear multiplayer video games.**

When discussing the ad placement, a term that is generally considered is placement prominence. Prominence has been discussed and/or defined as the size of the product/logo, centrality in the screen, integration into the plot, centrality to the plot, number of mentions, duration on the screen, strength of the placement and/or modality. All the variables related to prominence have been found to determine memory performance, making more prominent brands easier to remember than less prominent. Although these variables were considered for a study regarding television programs (Cowley and Barron, 2008), some of them can be used to test advertisements in video games. Research shows that the prominence of a brand placement, in a video game, has a positive effect on brand recall (Cauberghe and De Pelsmacker, 2010). In their study, prominence was manipulated by having the in-game advertisements moving or by having them in a static position and by placing them either in the centre or in the background. Since there are many distinct aspects within the concept of prominence, this study uses the size of the advertisement to manipulate brand prominence. However, Nelson (2002) defended that advertisement size did not matter in improving consumer brand recall, which, in turn, meant that higher prominence was ineffective in increasing recall levels. This was also discovered by Herrewijn and Poels (2014), where large advertisements did not outperform smaller advertisements in affecting awareness levels. Both these experiments used a racing game to test their hypotheses, which in both cases were simple and linear. Knowing this, prominence variables seem to vary in importance depending on the study. When it comes non-linear video games, brand prominence, more specifically advertisement size, should (theoretically) be a crucial factor that impacts brand recall and recognition. In the open-world maps, a larger advertisement should be more effective in catching players' attention than smaller advertisements, since these maps are often huge and small details are often missed. Therefore, the following hypotheses were created:

H3 **Advertisement size positively influences brand recall in non-linear multiplayer video games.**

H4 **Advertisement size positively influences brand recognition in non-linear multiplayer video games.**

2.6. Consumer Brand Involvement

One topic that has been getting noteworthy attention in the marketing literature is the concept of consumer engagement. Engagement, as a whole, has received significant attention around other numerous fields, such as sociology, political science, social psychology and organizational behaviour (Brodie, Hollebeek, Juric and Ilic, 2011). Amongst many different conceptualizations of engagement, consumer brand engagement (CBE) is a relatively recent one, which can be defined as "*a consumer's positively valenced cognitive, emotional and behavioural brand-related activity during, or related to, specific consumer/brand interactions*" (Hollebeek, Glynn and Brodie, 2014:154). Related to this topic, is consumer brand involvement which is the consumer's level of interest in a brand and the personal relevance of a brand (Zaichkowsky, 1994). Brand involvement is also considered an antecedent of CBE, meaning it is a variable that can measure how important a brand is to a consumer (Hollebeek, Glynn and Brodie, 2014). The same authors that conceptualized CBE concluded that consumer brand involvement has positive effects on cognitive processing, which can be explained as, in a specific consumer/brand interaction, the level of brand-related through processing and elaboration that a consumer has. When it comes to video games, Cauberghe and De Pelsmacker (2010) have studied the effects of involvement, more specifically product involvement. Their study, which used advergames, concluded that product involvement has a moderating effect on game repetition, where high involvement products suffered more from negative attitude effects of game repetition than low involvement products. When it comes to brand recall, their study had low or high involvement products placed in prominent areas or in subtle areas. As it was mentioned before, the authors concluded that brand prominence had an important and positive impact in influencing brand recall, meaning that product involvement was not as important as brand prominence. To test if involvement impacts brand recall and recognition, this test states the following hypotheses:

H5 **Consumer involvement positively influences brand recall in non-linear multiplayer video games.**

H6 **Consumer involvement positively influences brand recognition in non-linear multiplayer video games.**

To sum up all the previously mentioned hypotheses, the following framework was created which lists all the interactions this study took into consideration (see Figure 1). Both brand recall and recognition lead to brand awareness, which has been explained by previous literature, specifically from Keller (1993). The variables of influence that were tested were area population, advertisement size and involvement.

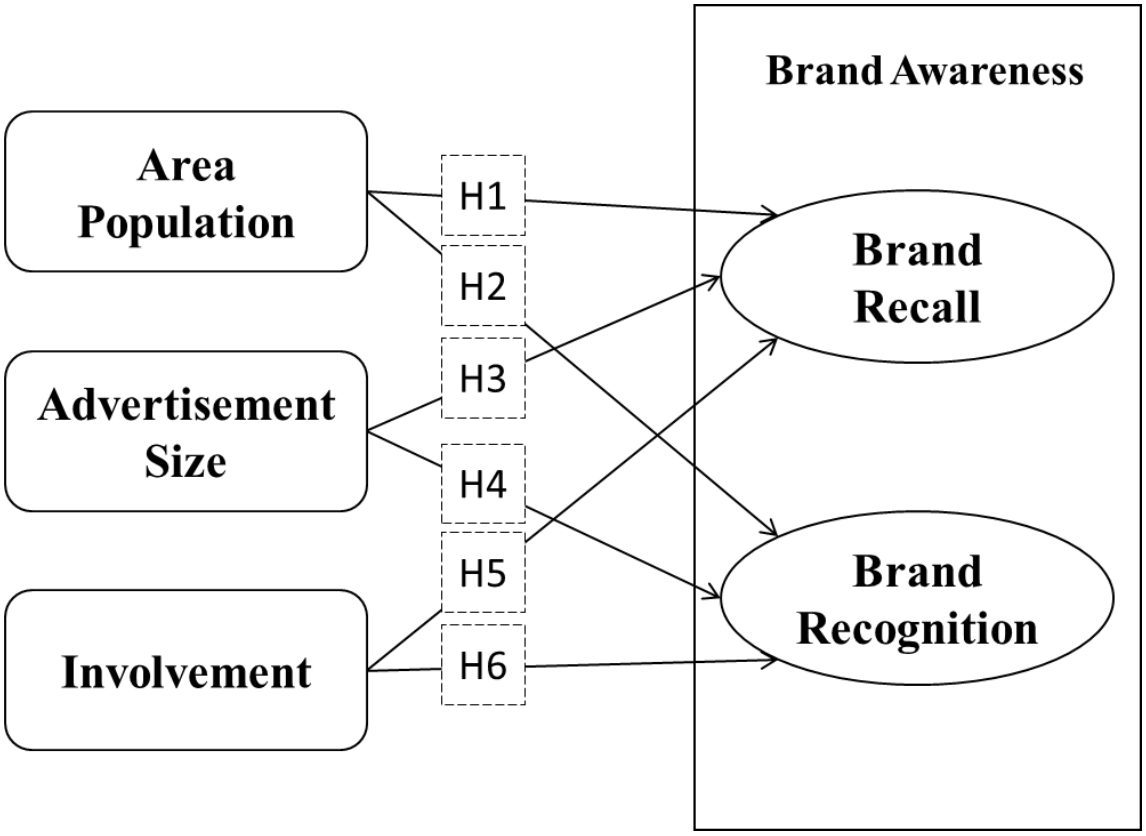


Figure 1 – Diagram of the conceptual framework

4. Methodology

4.1. Garry's Mod – An Online Sandbox Game

Garry's Mod is an online sandbox game created by Garry Newman, which allows players to create various additions to several games or even create brand new game modes, using Lua scripting. Such platform may be used to change how the game is played and some authors have used it for their tests. Jeong, Bohil, and Biocca (2011) used Garry's Mod to modify the game Half-Life 2 to change the game environment. The ability to change the game created a community within the game that continuously focuses on sharing their own creations while getting the feedback from players, motivating the creators to improve their conceptions and to create new ones, while giving players who do not know Lua scripting additional content to play with. To play Garry's Mod with others, players must connect to a server, where they can interact with the users connected to it, creating a smaller community within the game. One of these smaller communities, mostly comprised of American members, was used to conduct this present study regarding in-game advertising. This community plays on a Garry's Mod server with the DarkRP game mode, which attempts to simulate urban life by allowing players to pick from various jobs (Police Officer, Medic, Club Owner, among others) and to roleplay as their job. Like most social games, social interactions influence the results of this study, however these interactions were not measured due to limitations in accessing such information.

4.2. Pre-test for Brand Fit

To tackle the previously mentioned challenges, it is crucial to conduct some pre-research surveys to better understand how players would normally react to advertisements being placed in the game environment. Therefore, to know which brands have a better fit with the game environment, a survey was sent with questions regarding brand fit for 10 distinct brands, on a five-point Likert scale. The questions used for the survey (see Table 2) were adapted from Okazaki's and Yagüe's (2011) study. The chosen brands were McDonalds, Mountain Dew, Doritos, Monster Energy, Dell, Toyota, Samsung, Intel, Bank of America and Shell. The results from this test confirmed the brands players are more comfortable with seeing in Garry's Mod and which ones they are more familiar with. With 77 respondents, the brands that had the highest mean score overall were Mountain Dew (3.4), Doritos (3.4), Intel (3.2) and Dell (3.2). All the values can be seen in Table 3. With an average score above 3.0, it is possible to conclude that players perceive these brands as averagely good fits for in-game advertising for Garry's Mod, more specifically the gamemode DarkRP. Players are not used to seeing ads in this type of game, so these results are to be expected. Out of the 5 questions that were asked, the third one ("The brand and the main game features have similar images.") had the lowest results overall. Since these questions were adapted from a advergame study (Okazaki and Yagüe, 2011), these low results can be justified due to Garry's Mod not being a game solely created to advertise brands, so players are not accustomed to seeing sponsorships in a game.

Number	Item description
Question 1[a]	It makes sense to me that this brand sponsors this type of game.
Question 2[a]	The sponsor brand and the game type fit together well.
Question 3[a]	The brand and the main game features have similar images.
Question 4[a]	The ideas I associate with the brand are related to the ideas I associate with the game.
Question 5[a]	Other brands in this industry fit the game as well.

Adapted from Okazaki and Yagüe (2011)

Notes: [a] Items measured on a 5-point Likert Scale (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)

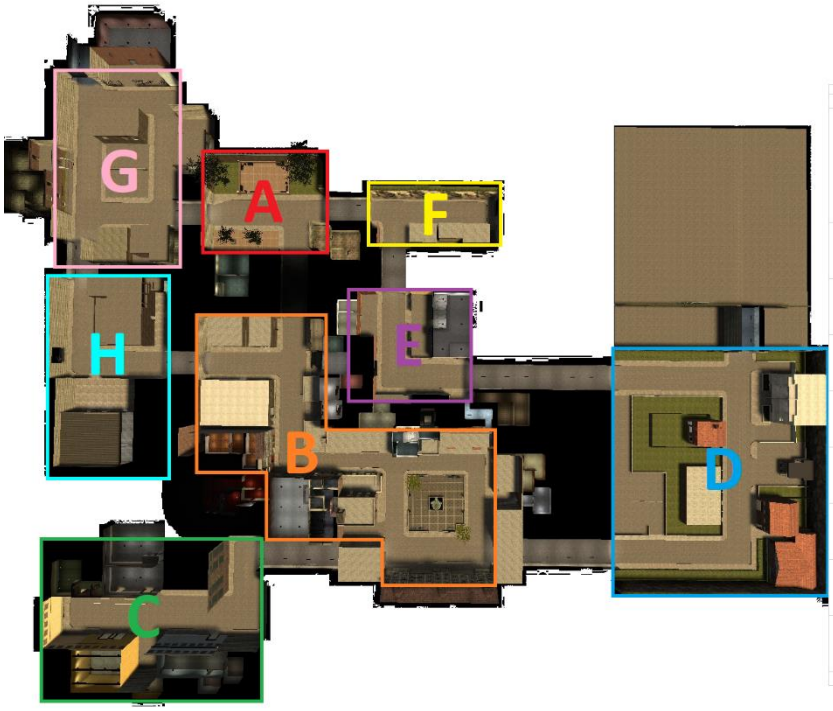
Table 2 – Pre-Test Survey Questions

Brands	Means						α
	Question 1	Question 2	Question 3	Question 4	Question 5	Overall Average	
McDonalds	2.66	2.66	2.56	2.62	3.00	2.7013	0.833
Mountain Dew	3.62	3.51	2.90	3.42	3.56	3.4000	0.856
Doritos	3.65	3.52	2.97	3.43	3.42	3.3974	0.902
Monster Energy	3.13	2.99	2.65	2.82	3.06	2.9299	0.890
Dell	3.45	3.25	2.92	3.00	3.19	3.2364	0.917
Toyota	2.12	2.22	1.99	2.16	2.29	2.1532	0.958
Samsung	2.82	2.75	2.49	2.68	2.78	2.7039	0.942
Intel	3.44	3.26	3.00	3.23	3.25	3.2364	0.917
Bank of America	2.39	2.31	2.18	2.19	2.42	2.3279	0.934
Shell	2.04	2.16	2.04	2.19	2.48	2.1818	0.935

Table 3 – Pre-Test Survey Results

4.3. Final Experiment

A month after conducting the pre-test, the advertisements were placed in the game for the main experiment. Three brands with a high brand-fit score were chosen and placed in-game with distinctive characteristics (see Table 4). Regarding brand location, it could either be placed in a highly populated area or in a less populated area. Area population was measured by checking, on average, how many times players pass through each area in one day (see Figure 2). For this test, areas A (high population), B (high population) and C (low population) were chosen. Size was also a factor, where it could be a big advertisement in the form of a billboard or a smaller advertisement in the form of a poster (see Figure 3). People recall advertisements more easily depending on the colours used (Schneider, 2005), so brighter advertisements will have higher recall levels than others. To avoid colours influencing recall and recognition results, all advertisements used bright colours.



Areas	Population Average
A	2126
B	1706
C	205
D	239
E	322
F	514
G	568
H	275

Figure 2 – Map Areas and Population Average

Due to the nature of how the DarkRP gamemode for Garry's Mod works, players have complete control over where they can go to around the map, so nothing that forced players to follow a certain path was implemented. This is a common characteristic in a non-linear game.

Figure 3 – Advertisement size comparison

Advertisement 1 was a billboard and it was placed in a highly populated area, advertisement 2 was a poster and it was placed in a highly populated area as well and, finally, advertisement 3 was a billboard and it was placed in the least populated area (see Figure 4). All the advertisement characteristics are listed in Table 4.

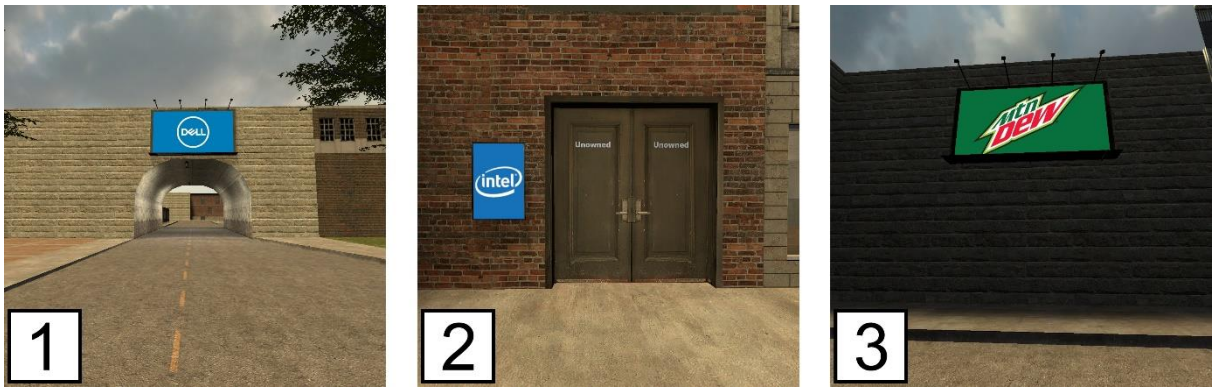


Figure 4 – Advertisement placements

Advertisement	Brand	Area	Area Population	Size
1	Dell	A	High	Billboard (Big)
2	Intel	B	High	Poster (Small)
3	Mountain Dew	C	Low	Billboard (Big)

Table 4 – Advertisement Characteristics

The participants (337 answers), as explained before, were players from a Garry's Mod DarkRP community. Only 268 of these answers were considered valid, due to some players giving out blatantly random answers. These were picked out if they had offensive words in open

questions. After playing for at least 30 minutes, players were asked to answer a brief survey (see Table 5) regarding the advertisements they were exposed to during gameplay. A summary of these 268 players are depicted in Figure 5 and Table 6.

Variables	**Item description**	**Author(s)**	**α**
Brand Recall	Which brands do you recall encountering while playing?	Martí-Parreño, Bermejo-Berros and Aldás-Manzano (2017); Van Steenburg (2012); Herrewijn and Poels (2014)	
Recognition (Product)	Which product categories appeared in the game environment as advertisements?	Herrewijn and Poels (2013)	
Recognition (Brand)	Which brands appeared in the game environment?	Herrewijn and Poels (2013)	
Recognition (Ad)	Which advertisements do you remember encountering while in-game?	Herrewijn and Poels (2013)	
Involvement[a]	Unimportant–Important to me Means nothing–Means a lot to me Useless–Useful to me	Zaichkowsky (1994); Hollebeek, Glynn and Brodie (2014)	0.916

Notes: [a] Items measured on 5-point Likert Scales

Table 5 – Survey Questions and Variables

Some players did not answer immediately after playing for 30 minutes and some even disconnected from the server, joined back later and answered then, which created high "Time Played" means (see Table 6). The majority (73.88%), however, did play between 30-60 minutes during the test before answering the survey. To reinforce this, the medians for "Time Played" were 344 minutes (total) and 34 minutes (during test). During this time, every time a player would have the advertisement fully on screen, it would be tracked and sent to a database, meaning the number of times a player would see the ad would be stored (Times Seen). An advertisement is considered to be fully on screen when its entirety is display on a player's screen during gameplay. General player information was also taken into consideration, such as player score (which is determined by the number of times they have killed another player in combat), in-game wallet (how much game money they have), total time spent playing on the server,

number of friends on Steam (a digital distribution platform for video games that has social networking services) and real-life payments made for the server. As an incentive, an appealing reward (in-game money and an exclusive weapon) was given to players who answered the survey.

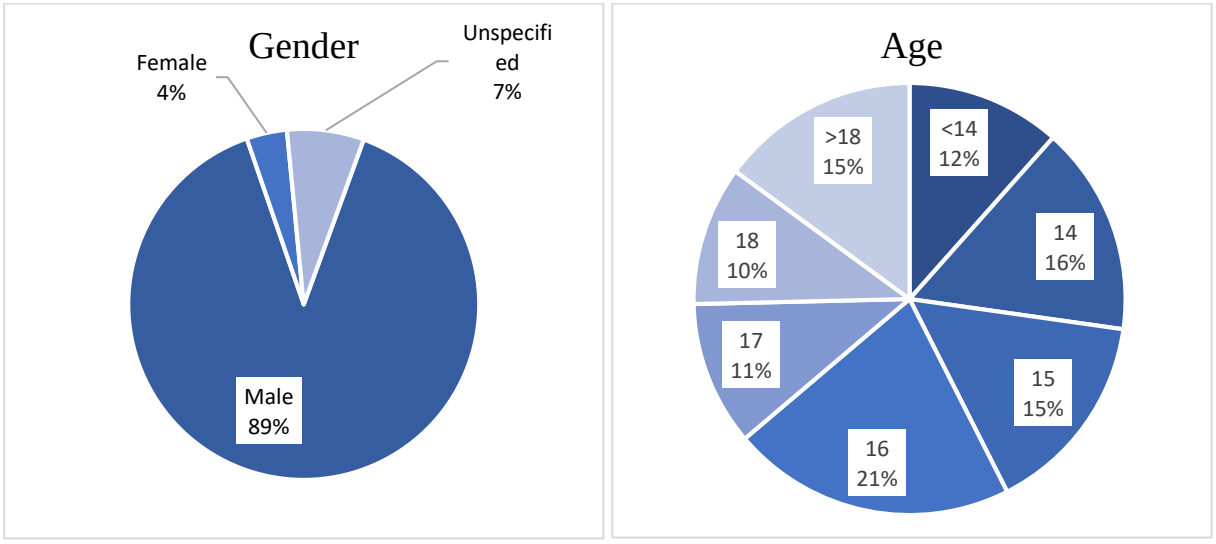


Figure 5 – Players' gender and age groups

Even though the clear majority of players in the current study were male (89%) and teenagers, this does not necessarily contradict Mena and Cookman (2017) in their statement (on how the video game market is not just comprised of male teens and young adults in their 20s). These results simply characterized this very specific segment of video game consumers and should not be used to generalize the whole video game market. Like previously mentioned, Table 6 shows the means and standard deviations for player characteristics. Because most of the values had a high variance value, Table 6 also depicts the medians for the same characteristics, to better represent the majority of players that were involved in the experiment. It is also important to mention that the In-Game Wallet ignored values above $50 000 000, which amounted to 8 players (server administrators) who use this money for server testing/problem solving.

Variable	Age	Steam Friends	Score	Time Played (Minutes)		Payment (USD)	In-Game Wallet (USD)
				Total	During Test		
Mean	16.2	78	499.8	3951	110	$9.13	$2 604 132
Median	16	49	21.5	344	34	$0.00	$301 716
Std. Dev.	2.866	78.231	1260.95	9131.6	230.746	$35.07	$6 031 307

Table 6 – Player characteristics

4.4. Measurement Scales

Recall was measured with an open question that asked players to write down all the brand names that they recalled encountering while playing the game. This method has been used in numerous studies that measured recall levels (Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017; Van Steenburg, 2012; Herrewijn and Poels, 2014).

Recognition was measured on three distinct levels: Industry, Brand and Advertisement. First, the survey presented players with a list of product categories, then with a list of brand names, and finally with a list of pictures of the images that could have been used as advertisements. On all occasions, players needed to pick which categories, brand names and advertisements they remembered encountering playing the video game. Each question had the correct options, some filler options and an 'I don't know' selection as an answer for each option. This type of measurement was adapted from a study conducted by Herrewijn and Poels (2013). Ultimately, $recognition_{Brand}$ will be the one to test the hypotheses, but checking the differences between these three distinct categories will reinforce the final conclusions.

To end the survey, some questions regarding involvement were presented. Adapted from Zaichkowsky (1994) and Hollebeek, Glynn and Brodie (2014), three questions that measured a brand's involvement were asked for each brand that was in-game. These items were measured on 5-point Likert scales. Like previously mentioned, all the questions that were asked are summarized on Table 5.

The values used to calculate the population of each area were used as measurements for area population. Advertisement size was defined as a dichotomous variable (0 if it was a poster and 1 if it was a billboard). Each player had information for 3 different advertisements and, therefore, the dataset includes three lines of data for each player, like previously mentioned.

To better sum up all the independent variables that were assembled, Table 7 has a summarized description for each variable that was used in this study. All the data for these variables, except involvement which is related to survey answers, was stored in private and public databases. Note that the variables "Time Played", "Score", "Payments" were picked to measure how committed a player is to the game server, so these variables go back to the time they first joined and played on the server, regardless if it was before or during the recall and recognition test. As an example, the variable "Time Played" for a player could be 13436 minutes (223 hours), which is the player's total time spent playing on the server.

Variables	Description
Area Population	How many players pass through these zones on average per day
Advertisement Size	0 = Poster (small), 1 = Billboard (large)
Involvement	A player's level of interest and importance in a brand (1 - 5)
Times Seen	How many times a player had the advertisement fully on screen during testing
Time Played	How long a player has been playing on the game server since they first joined (Minutes)
Steam Friends	The number of friends on their Steam account
Payments	How much money they spent on the server (USD)
Score	How many “player kills” players have since they first joined
In-game Wallet	How much in-game currency they have ($)

Table 7 – Summarized description for each variable

5. Results

5.1. Logistic Regression

To confirm the hypotheses, logistic regression was used for modelling the four dependent variables: brand recall (model 1), $\text{recognition}_{\text{Industry}}$ (model 2), $\text{recognition}_{\text{Brand}}$ (model 3) and $\text{recognition}_{\text{Ad}}$ (model 4). Logistic regression is a common method used by many authors when addressing recall and recognition, mainly due to their dichotomous nature (Hwang *et al.*, 2017; Davtyan, Stewart and Cunningham, 2016; Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017). Table 8 shows the means of the survey responses, with recall and recognition scores varying between 0 and 1, while involvement scores varying between 0 and 5.

		Recognition			
	Recall	Industry	Brand	Ad	Involvement
Dell	0.31	0.60	0.50	0.51	3.17
Intel	0.24	0.60	0.51	0.51	3.57
Mountain Dew	0.12	0.45	0.35	0.34	2.78

Table 8 – Means for the survey results

For this test, area population, advertisement size, involvement and the number of times the advertisement was fully on screen (Times Seen) were used as independent variables. No repeated measures were used. The variable "Times Seen" functioned as a way to measure repetition, in order for us to compare its importance as a predictor with the other variables. The data showed some imbalances (see Table 9), so some balancing procedures were applied in order to make the results less biased. This was done by discarding random records of results that occurred too often (e.g., removing results where brand recall = 0 until there were balanced 0 and 1 results for the brand recall model) and the new results can be seen in Table 10. According to Chawla (2005), when the data classes that need to be predicted are unbalanced among themselves, classification models should not be created without prior balancing techniques, since these techniques are beneficial for better results. Recognition (Industry) did not suffer any changes due to the results being satisfactory. There were 804 cases in total for the full dataset, which translates to 268 participants' data regarding 3 different advertisements. A summarized version of all the model results is shown in Table 11.

Results	Brand Recall		Recognition (Industry)		Recognition (Brand)		Recognition (Ad)	
	n	%	n	%	n	%	n	%
0	626	77.86%	361	44.90%	439	54.60%	439	54.60%
1	178	22.14%	443	55.10%	365	45.40%	365	45.40%
Total	804	100.00%	804	100.00%	804	100.00%	804	100.00%

Table 9 – Distribution of data results before balancing

Results	Brand Recall		Recognition (Industry)		Recognition (Brand)		Recognition (Ad)	
	n	%	n	%	n	%	n	%
0	201	53.03%	361	44.90%	361	49.72%	356	49.38%
1	178	46.97%	443	55.10%	365	50.28%	365	50.62%
Total	379	100.00%	804	100.00%	726	100.00%	721	100.00%

Table 10 – Distribution of data results after balancing

Model 1, which was related to brand recall (dependent variable), was statistically significant at $p < 0.001$ (Omnibus Test), meaning it was statistically better than the baseline one (a model without explanatory variables). A significant effect to recall caused by area population ($B = 0.0005$, Wald = 13.710, $p < 0.001$) and involvement ($B = 0.229$, Wald = 7.8, $p < 0.05$) was discovered, confirming hypotheses **H1** and **H5**, which theorised that recall would be positively influenced by populated areas and player's involvement. However, advertisement size did not seem to have a significant effect on recall ($B = 0.112$, Wald = 0.244, $p > 0.05$), which makes us unable to confirm **H3**, which proposed that recall would be positively influenced by advertisement size.

Proceeding to the recognition models and starting with the industry one, model 2 was statistically significant at $p < 0.001$ (Omnibus Test). Involvement had a significant effect ($B = 0.2647$, Wald = 25.242, $p < 0.001$) on $\text{recognition}_{\text{Industry}}$. However, area population ($B = 0.0001$, Wald = 2.26, $p > 0.05$) and advertisement size ($B = 0.1598$, Wald = 0.874, $p > 0.05$) had a non-significant interaction effect in this model.

Moving on to the next recognition model, possibly the most important one, model 3 was also statistically significant at $p < 0.001$ (Omnibus Test). This time, results were very close to the ones the recall model showed, with both involvement ($B = 0.1782$, Wald = 10.463, $p < 0.05$) and area population ($B = 0.0003$, Wald = 6.955, $p < 0.05$) having a significant effect on

recognition$_{Brand}$. Advertisement size (B = 0.0458, Wald = 0.069, p > 0.05) still showed a non-significant effect, much like the recall model.

Finally, ending with the recogntion$_{Ad}$, model 4 was statistically significant as well, with a p < 0.001 (Omnibus Test). This model also had similar results to the recall model, showing significant effects caused by involvement (B = 0.1687, Wald = 9.790, p < 0.05) and area population (B = 0.0002, Wald = 6.037, p < 0.05). Again, advertisement size showed a non-significant effect (B = 0.0467, Wald = 0.073, p < 0.05).

	Model 1 Brand Recall		Model 2 Recognition (Industry)		Model 3 Recognition (Brand)		Model 4 Recognition (Ad)	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Constant	-1.8594	0.4282	-1.1541	0.2717	-1.0738	0.2821	-1.0065	0.2821
Variables								
Area Population	0.0005**	0.0001	0.0001	0.0001	0.0003*	0.0001	0.0002*	0.0001
Times Seen	0.0023*	0.0012	0.0059**	0.0015	0.0029*	0.0011	0.0026*	0.0010
Involvement	0.2293*	0.0821	0.2647**	0.0527	0.1782*	0.0551	0.1687*	0.0539
Advertisement Size	0.1215	0.2458	0.1598	0.1710	0.0458	0.1741	0.0467	0.1726
−2 log likelihood	487.2880		1041.2620		967.4810		966.3350	
Nagelkerke R Square	0.1230		0.1040		0.0700		0.0600	
Omnibus model chi-square	36.721**		64.941**		38.946**		33.071**	
Accuracy								
Correct	63.9%		63.1%		60.5%		61.9%	
Wrong	36.1%		36.9%		39.5%		38.1%	
Area Under Curve (AUC)	0.667		0.663		0.628		0.647	

* p < 0.05
** p < 0.001

Table 11 – Logistic Regression summarized results

From the recognition results, it is safe to confirm **H6** hypothesis, which theorized that consumer involvement would have a positive effect on brand recognition. However, it was not possible to confirm the **H4** hypothesis, which stated that recognition levels would be positively influenced by advertisement size. Even though it was not possible to fully confirm **H2** hypothesis on Model 2, the other two models were able to confirm it, thus partially confirming the hypothesis. As a reminder, this hypothesis defended that populated areas would have a positive influence on recognition levels.

It is important to note that the variable "Times Seen" always had a significant effect in all the models: brand recall (B = 0.0023, Wald = 3.924, p < 0.05), recognition$_{Industry}$ (B = 0.0059, Wald = 16.151, p < 0.001), recognition$_{Brand}$ (B = 0.0029, Wald = 7.763, p < 0.05) and recognition$_{Ad}$ (B = 0.0026, Wald = 6.825, p < 0.05). Regarding predictor importance, "Times Seen" was the most important one for all recognition models (see Figure 6). The predictor importance chart indicates the relative importance of each predictor in estimating the model

and helps researchers understand which variables should be dropped from the model or ignored. The sum of the values for all predictors will always be 1, since these values are relative. For the recall model, area population was, by far, the most important one. The independent variables "Area Population" and Times Seen" presented extremely low B results due to the high values these variables possess, with max values of 2126 for "Area Population" and 1000 for "Times Seen". Although the Omnibus Test gave us good results, the Nagelkerke R Square showed low results in the four models. In simple terms, the closer this R-squared is to 1, the better the model in terms of accuracy in predicting the dependent variable. Accuracy percentages and UAC values were considerably low as well for all the models, with UAC below 0.7 and correct predictions below 70%. All these low values tell us that more independent variables are needed to create a more accurate model.

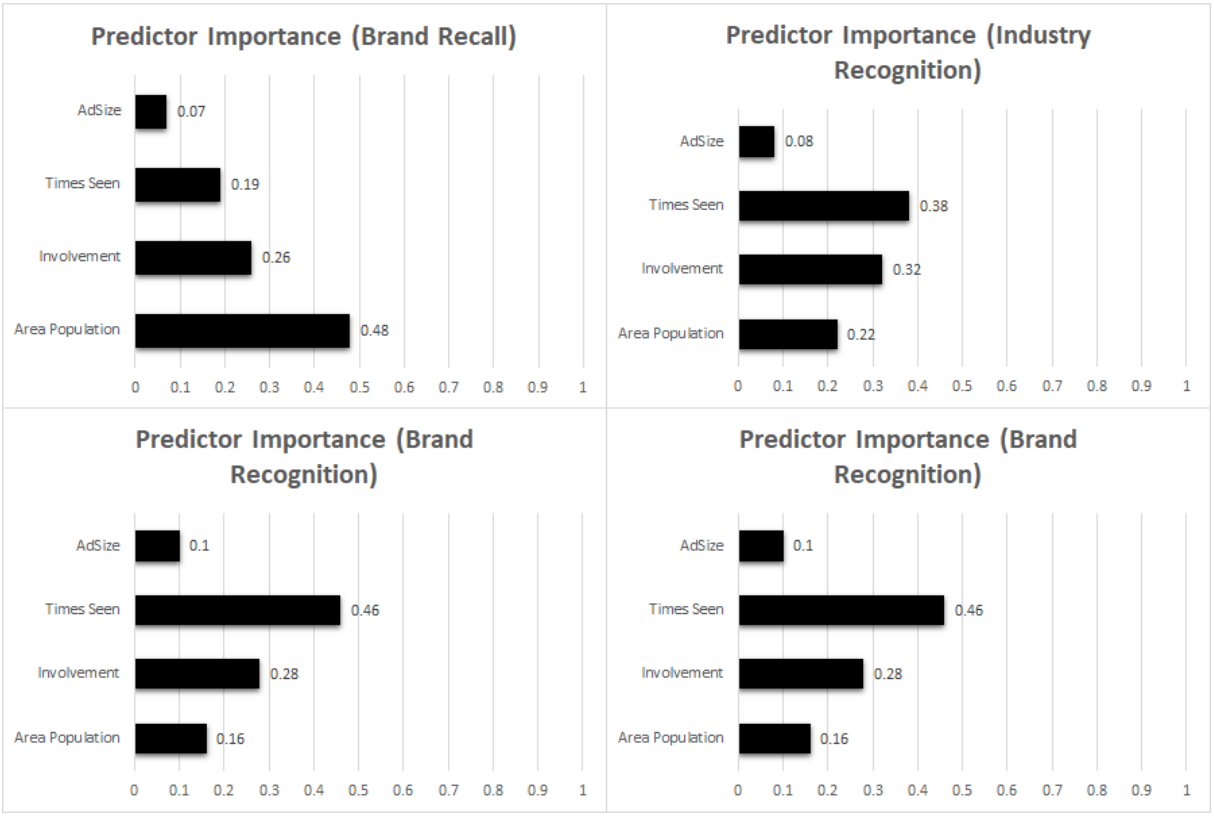


Figure 6 – Predictor Importance Graphs (Logistic Regression Models)

5.2. Decision Trees

To better complement the present study, a decision tree for each dependent variable was created to further test how important the test variables are when compared to player variables. Decision trees are data-based built models that fit the data to better model a given target, with the final decision being composed of a sequence of IF-THEN rules (Moro, Cortez and Rita, 2018). C&R Trees were used, with a maximum tree depth of 5, pruning to avoid overfitting and stopping rules that enforce minimum records of 2% in parent branches and 1% in child branches. As previously mentioned, the player attributes that were added to the model are the following: Score, Time Played (total playtime, starting from the first day they joined), Steam Friends, In-game Wallet and Payments. Each decision tree was numbered in the same order as the previous models were.

Starting with Decision Tree 1, which tried to predict the outcome of brand recall, had Times Seen, Score, Involvement and In-game Wallet as the most important attributes. This tree contains 274 observations and the most influential variable was Times Seen. More importantly, 94,34% of participants who saw the advertisement at least 1 time (>0.5 on average) and a had score value higher than 841 were able to recall the brand. However, 87.88% of participants who saw the ad at least once, but had a score of 841 or less and low involvement (less or equal to 1.5) were not able to recall the brand. All players (100%) who did not see the advertisement at least 1 were, obviously, unable to recall the brand. The full tree can be viewed in Figure 7. Regarding accuracy (see Table 12), the tree model was able to correctly predict 74.15% of the tested cases, with a AUC (area under curve) value of 0.849 (the closer to 1, the more accurate the model is).

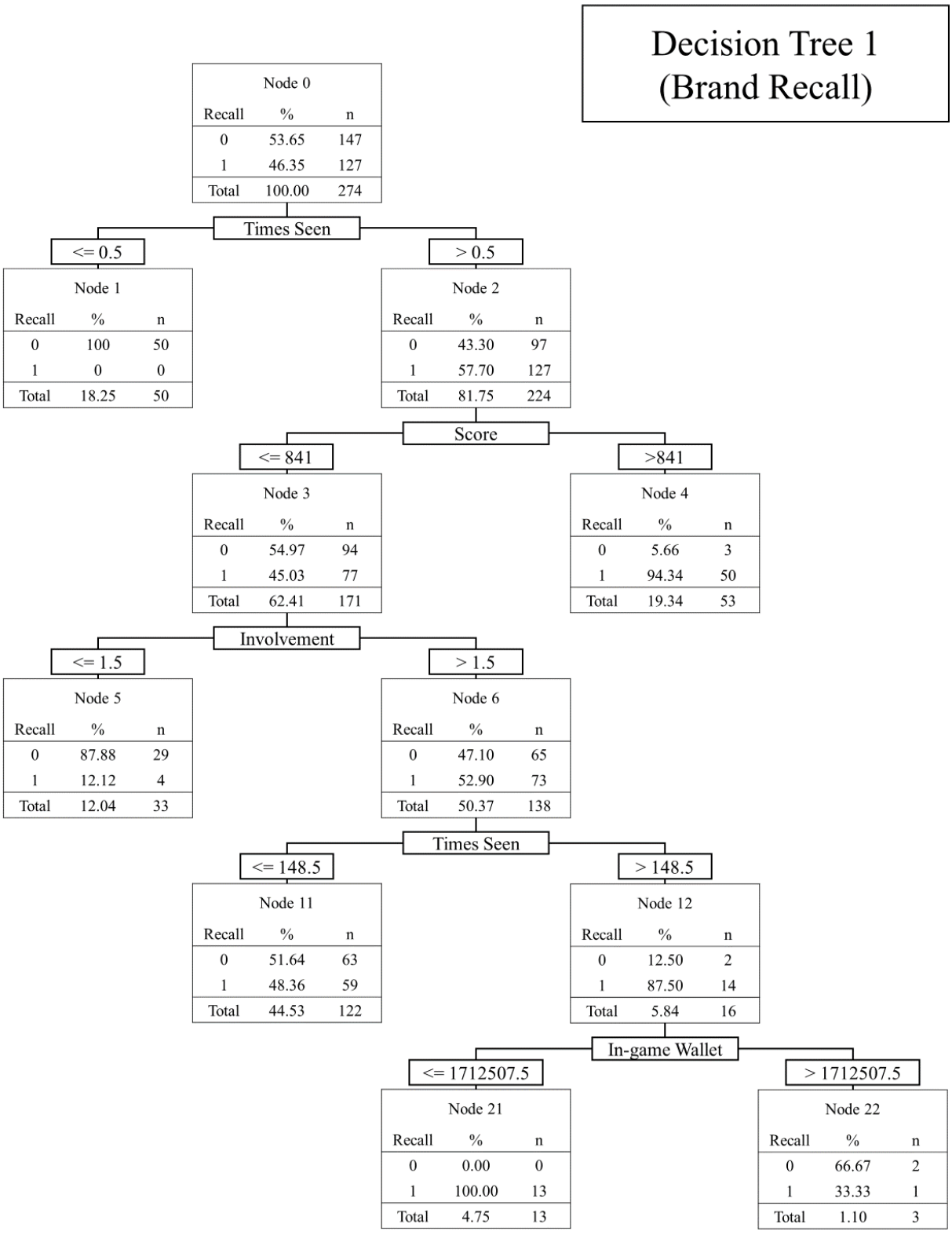


Figure 7 – Decision Tree 1 (Brand Recall)

Brand Recall	Predicted		Percentage Correct	Area Under Curve (AUC)
	0	1		
0	199	93	68.15%	
1	6	85	93.41%	
Overall			74.15%	0.849

Table 12 – Decision Tree 1 (Brand Recall) Accuracy

The second decision tree was related to recognition$_{industry}$ and it was much simpler than the previous one. With 584 observations, 73.59% of players who had a "Time Played" above 147.5 minutes and saw the advertisement at least 3 times (>2.5) were able to recognize the industry of the brand. On the other hand, 61.08% of players with a "Time Played" value below 147.5 minutes were not able recognize the industry. The full tree can be viewed in Figure 8. Once more, looking at the accuracy values, the decision tree model was able to predict 67.04% of the studied cases, with a AUC value of 0.682 (see Table 13).

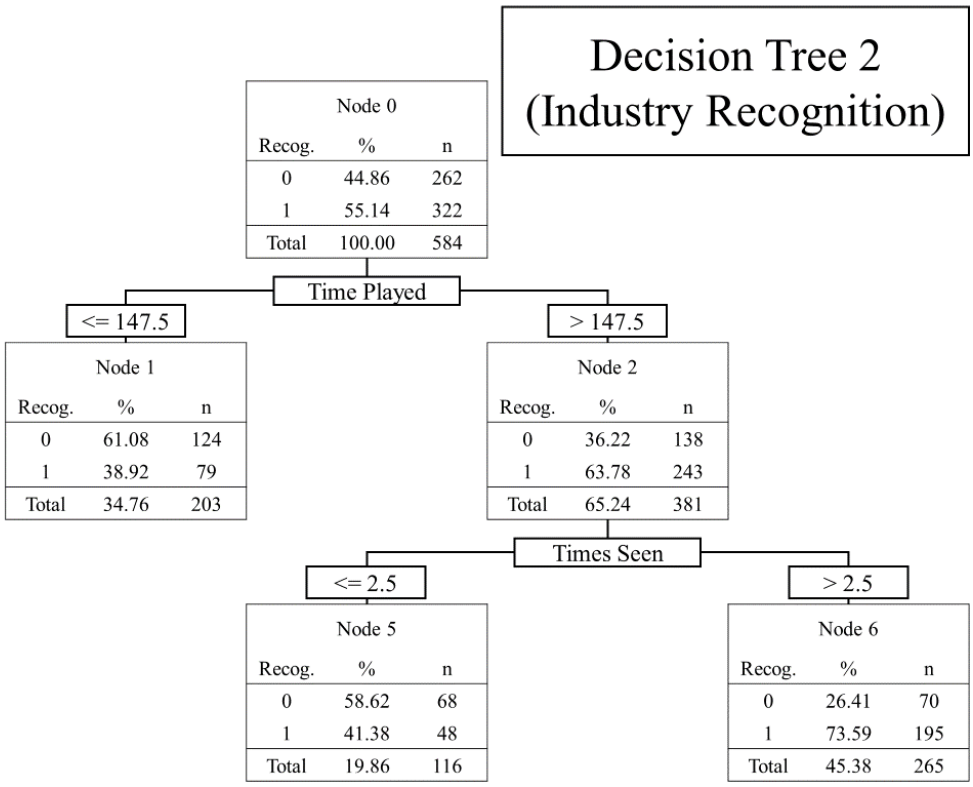


Figure 8 – Decision Tree 2 (Industry Recognition)

Recognition (Industry)	Predicted		Percentage Correct	Area Under Curve (AUC)
	0	1		
0	266	95	73.68%	
1	170	273	61.63%	
Overall			67.04%	0,682

Table 13 – Decision Tree 3 (Industry Recognition) Accuracy

Decision tree 3 tried to predict the outcome of $recognition_{brand}$ and it shared some similarities with the first decision tree. Having 517 observations, 83.10% of players who saw the advertisement at least 4 times (>3.5 on average) and had a score value higher than 71.5 were able to recognize the brand. Secondly, 64% of players that also saw the ad at least 4 times, but had a score value between 1.5 and 71.5, more than 20 friends on Steam (>19.5 on average) and a "Time Played" value of 74.5 or higher were able to recognize the brand. Adding to this group of players that saw the ad at least 4 times and had more than 20 friends on steam, 100% of these players were able to recognize the brand if they had an extremely low score (<= 1.5). A considerable percentage of players who did not see the ad more than 4 times (69.94%) were not able recognize the brand. The full tree can be viewed in Figure 9. Looking at the accuracy values for this tree model, 69.4% of cases were correctly predicted, with a AUC value of 0.719 (see Table 14).

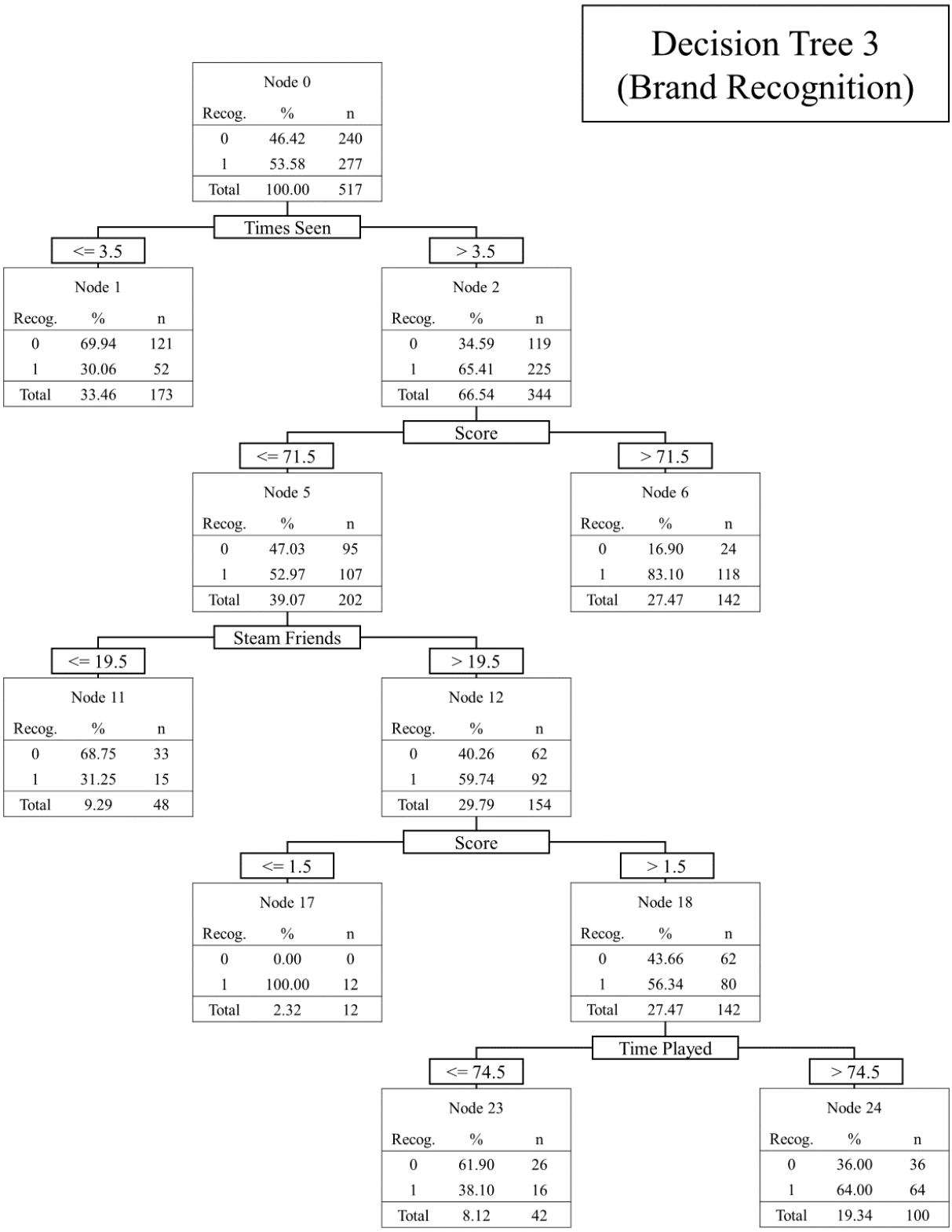


Figure 9 – Decision Tree 3 (Brand Recognition)

Recognition (Brand)	Predicted		Percentage Correct	Area Under Curve (AUC)
	0	1		
0	254	120	67.91%	
1	100	245	71.01%	
Overall			69.40%	0.719

Table 14 – Decision Tree 3 (Brand Recognition) Accuracy

The final decision tree attempted to predict the outcome of $recognition_{ad}$, with 514 observations. The variable "Times Seen" was the most important factor, similarly to all the previous decision trees. In this case, 83.06% of players who saw the advertisement at least twice (>1.5 on average) and had a score value higher than 153.5 were able to correctly recognize the actual ad. Once more, low number of sightings of the ad in-game led to unsuccessful recognition, with 76.87% of players who did not see the ad at least twice (<= 1.5) were unable to recognize the ad. The full tree can be viewed in Figure 10. Finally, viewing the accuracy results, the tree model correctly predicted 71.25% of the cases, with a AUC value of 0.749 (see Table 15).

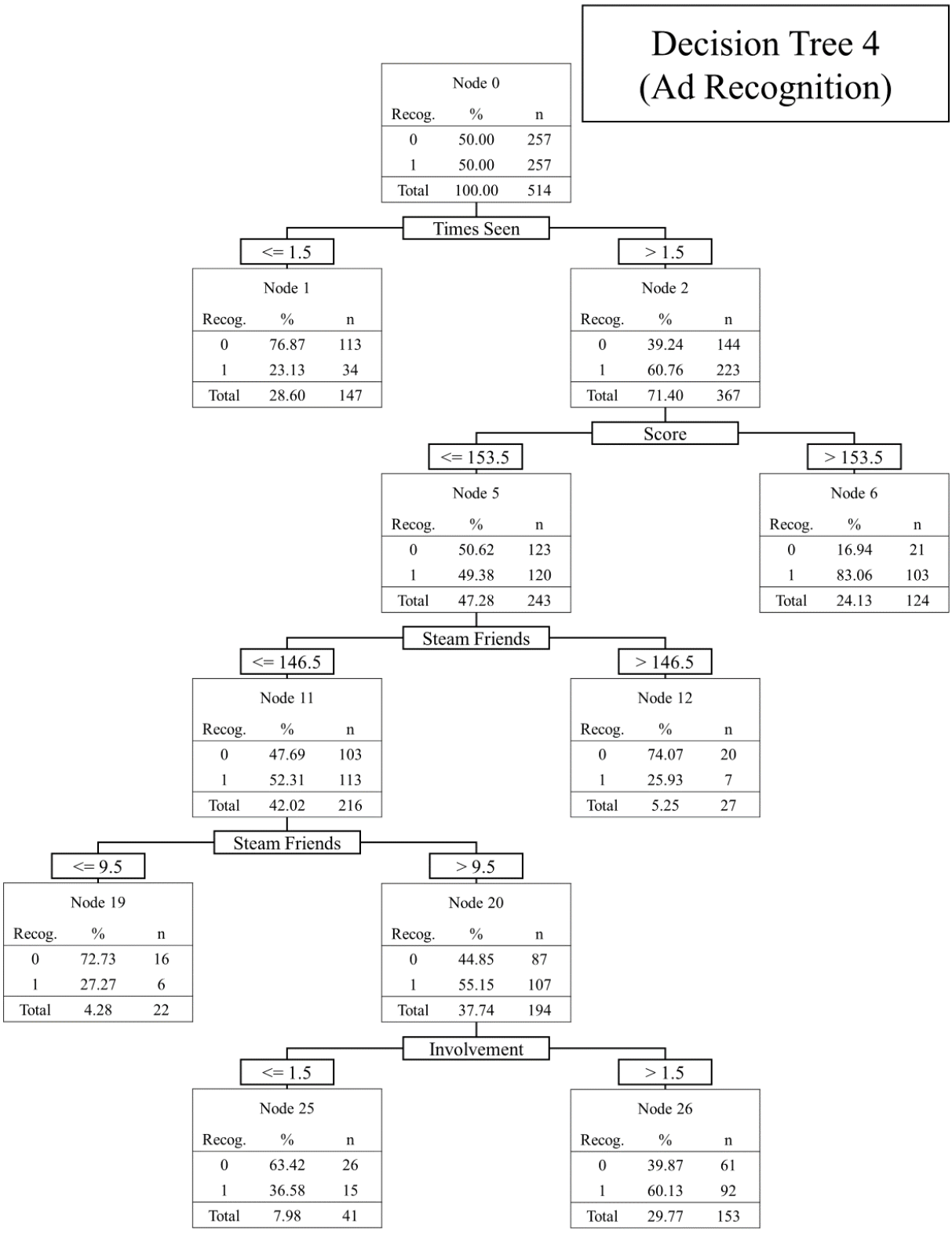


Figure 10 – Decision Tree 4 (Ad Recognition)

Recognition (Ad)	Predicted		Percentage Correct	Area Under Curve (AUC)
	0	1		
0	231	88	72.41%	
1	117	277	70.30%	
Overall			71.25%	0.749

Table 15 – Decision Tree 4 (Ad Recognition) Accuracy

Although the decision trees were very simple by design, the obtained accuracy values were much higher than the ones from the Logistic Regression model. Also, while more sophisticated non-linear models could be adopted such as neural networks or support vector machines, the decision trees can be directly interpreted, which is a key advantage when providing decision support to marketers (Moro, Cortez and Rita, 2014).

To end this analysis and to better compare the results with the ones from the logistic regression models, the predictor importance for each variable was tested once more (see Figure 11). Results show that the variable "Times Seen" had a huge importance in the four decision trees. Comparing these results with the ones from the logistic regression models, advertisement size was, once again, trivial in predicting the outcomes, having an even lesser importance in these graphs than the previous ones by not showing up. If we compare both brand recall graphs, we can see that "Times Seen" gained much more importance in the new one, with area population and involvement dropping in importance. The $recognition_{industry}$ graphs showed a close similarity with each other, with "Times Seen" having a high predictor importance and area population being in par with most variables that were tested. However, advertisement size and involvement did not seem to have any convincing importance in predicting the outcome of recognizing the industry of the brand. Some interesting similarities were evident between the two $recognition_{brand}$ graphs. Firstly, "Times Seen" was, as usual, the most important predictor and advertisement size lost its importance. However, a player's involvement with the brand no longer was an important predictor and area population was on par with most of the other variables. Finally, two $recognition_{ad}$ graphs were very different. Although, "Times Seen" remained as the most important predictor, involvement and advertisement size were deemed irrelevant and area population adopted a low predictor importance, much like the other decision tree graphs, staying on par with most variables. The variable "Score" had a high importance in the Decision Trees 1, 3 and 4 and "Time Played" was extremely relevant for both Decision Tree 2 and 3. In general, these decision trees show inconsistent levels of predictor importance, except for the variable "Times Seen" and, partly, for the variable "Score".

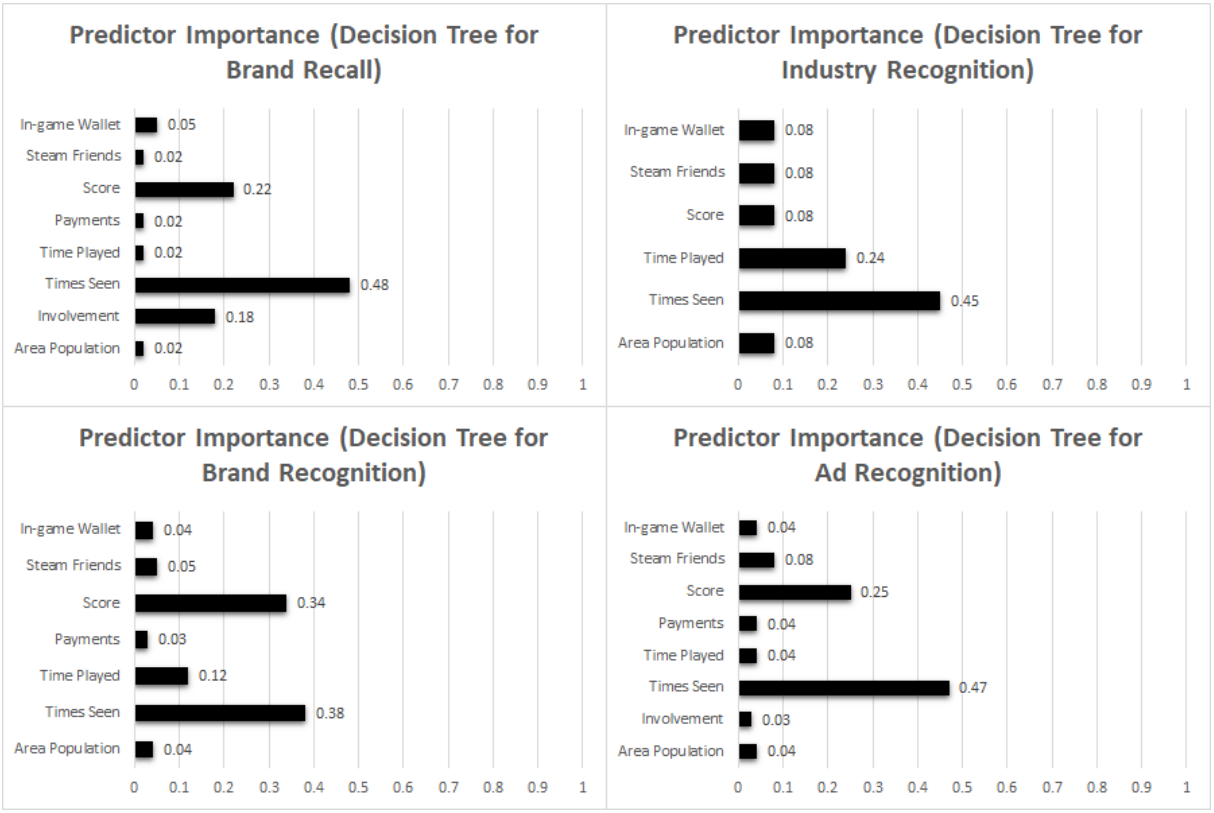


Figure 11 – Predictor Importance Graphs (Decision Trees)

6. Discussion

The results from the logistic regression models suggest that high population areas impact consumer's memory if advertisements are placed within non-linear multiplayer video games and that advertisement size will not be impactful at all. This lack of impact was also discovered by Herrewijn and Poels (2013), where large advertisements were not able to lead to significant differences in brand awareness compared to smaller ones, which was also defended by Nelson (2002). The results showed higher recognition levels than recall levels, which is a common occurrence, due to recognition being a more sensitive measure of memory than recall (Lang, 2000). The study was also consistent with previous research, not only regarding the impact of advertisement size and the difference in recognition and recall levels, but also with the significance of repetition, which was measured with the "Times Seen" variable (Martí-Parreño, Bermejo-Berros and Aldás-Manzano, 2017; Schmidt and Eisend, 2015). Even though the research conducted by Cauberghe and De Pelsmacker (2010) showed that repetition in excessive amounts is insignificant for recall levels, their study was done in an advergame, with lack of complexity within the game and with repetition being measured by forcing players to play the game two times or four times. A non-linear game can be characterized by its complexity (allowing a lot more player action) and the way we measured repetition was very uncontrolled. A player could see the same advertisement 3 times, 50 times or even 100 times during testing, the amount of times could be any number, it all depended on what the player did while playing.

The differences between the recognition models suggest that there are a lot of factors that are missing that can more accurately predict recognitions levels. The repetition variable "Times Seen" did have a significant importance in all of them, but this was somewhat expected. Of course, a player will only recall/recognize something if they see it at least once and this was proven in the decision tree analysis.

Some attributes regarding player characteristics were tested and showed some importance in the decision tree analysis. Terlutter and Capella (2013) mention how advertising outcomes can be influenced by individual and social factors regarding the player. The current study's results are aligned with their framework and even suggest that some individual factors of the player can be more important than some advertisement characteristics. For example, the variable "Score", which translated to the total numbers of "player kills" a player had since they

first joined the Garry's Mod server, had some relative importance in the decision trees. It is safe to consider this value as a way to measure player involvement with the game or, in this case and more specifically, the server where this experiment took place. Calleja (2011) divided player involvement into six different dimensions, one of them being related to pursuing goals/objectives, decision-making and reward systems: ludic involvement. Knowing this and the results from our "Score" variable, individual player factors that affect player involvement were proven to be important variables that affect brand awareness in this type of game.

Discussing brand involvement, these results are not in line with the research done by Cauberghe and De Pelsmacker (2010), where it was concluded that the effect of brand prominence has a greater impact on recall than brand involvement. As it was previously mentioned, brand prominence was defined in this study as the size of the advertisement, which was consistently unimportant as a predictor for all the studied models, confirming the findings of previous authors (Nelson, 2002; Herrewijn and Poels, 2013). Brand involvement did, however, prove to be a notable predictor for the brand recall logistic model. These results are not enough to disprove these authors' (Cauberghe and De Pelsmacker, 2010) research, due to the fact that brand prominence can incorporate various variables and characteristics for a brand/advertisement.

The pre-test results, even if their initial objective was to pick the most congruent brands to implement on the server, showed that even common worldwide known brands have an average congruency level when it comes to non-linear multiplayer video games that are not accustomed to having advertisements on them. DarkRP for Garry's Mod is meant to mimic an urban lifestyle, with the objective of having players roleplay as a specific role that you would normally see within a big city (police officers, citizens, gun dealers, the mayor, chefs, among others), so it is unusual for players not to perceive in-game advertisements of popular brands as highly congruent in these scenarios.

7. Conclusions and Managerial Implications

The goal of this study was to understand if area population, advertisement size and brand involvement were significant as influencers of brand recall and recognition, while comparing their importance with other variables such as repetition and player characteristics. Although we were safely able to reassure the significance of area population and involvement, advertisement size seems to be less important, or even meaningless, when it comes to improving recall/recognition levels in a non-linear video game. Repetition evoked by the player's own action and the player's own commitment to the game seem to be more relevant factors regarding brand recall and recognition. If a player has been playing the game for a long time, any changes will be more significant to them, so implementing advertisements in a game that has medium congruency levels for brands in general will be more easily noticed by these players rather than new ones.

Companies interested in implementing advertisements in non-linear video games should understand that, because of a non-linear multiplayer video game has a prominent level of uncertainty, placing advertisements in more populated areas will be significant and it will increase recall/recognition results, but individual player factors may be the ultimate decider of whether or not players can recall/recognize advertisements successfully. Regardless, with the results from this study, companies should split the segments of their player base, having a segment for new players and another for veteran players. These two segments recall and recognize game changes much differently, so any new advertisements will have different impacts on these players' memories.

Regarding brand congruity, advertising companies should be very cautious when implementing their brands in a game not accustomed to showing advertisements. Even if the brand fits the environment, it might still be considered as something odd for players, so learning what players will and will not accept in the game environment should be the priority for these companies.

8. Limitations and Future Research

A concerning limitation of this study is the incentive that was given to players to answer the survey. Players could have easily rushed through the survey just to get the reward, which some obviously did by giving random answers in the open questions (which were not counted for the final dataset). To avoid this being an issue, future research should still attempt to study this segment of video game players who play non-linear video games but without giving an encouragement to participate in the test. This study only took into consideration one non-linear multiplayer video game, which can make these results biased and only applicable to this game. Because most video games are different from each other, especially non-linear/sandbox multiplayer games, other video games should be tested to confirm these results. The dataset was organized into three lines of data for each player, since one player would give us information for three different advertisements. Because of this, some variables regarding the players' characteristics would be repeated, hence why it was not used in the logistic regression test. Future research should test these variables using logistic regression by having one player only test one scenario/advertisement, in order to avoid repeated measurements.

The fact that this test took place in a game server with no control over how players would react to it may I have caused issues. Reports from server moderators informed that some players attempted to vandalize the advertisements, by hiding them with a large object. These attempts were stopped but it shows that lack of control can be destructive to the test. Regardless, this lack of control is natural for a non-linear game. However, some control should always be put in play, so future research should keep the non-linear nature of the game but limit possible obstructions for the test. Adding to all this, the multiplayer aspect of the game may have changed the outcomes of recall/recognition and any social interactions were not measured in this study. Research regarding these types of interactions during gameplay, such as, if a player communicated with other players during gameplay or if a player engaged in cooperative gameplay with other players, may influence the outcomes of recall/recognition, especially if the mention of the advertisements was included in their conversations.

Although brand involvement and congruency were used in this test, the differences that they had before and after the test were not checked. Depending on how the advertisements are placed in-game, some changes to involvement and congruency may happen, so future research should attempt to explore the effects of advertisement size and area population in these variables.

Regarding marketing communication outcomes, the effects that these types of ads have on the intent to purchase a product from that brand or their love for the brand may also change, so it should be something to consider for future research.

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Annexes

Annex A – Pres-test Survey

Title: Garry's Mod DarkRP Brand Fit

DarkRP is a game mode for the popular game Garry's Mod with the idea of a simulation of urban life. Knowing this, please answer the following questions regarding each brand.

Survey Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Your SteamID (https://steamidfinder.com/):

_____

McDonald's

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Mountain Dew

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Doritos

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Monster Energy

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Dell

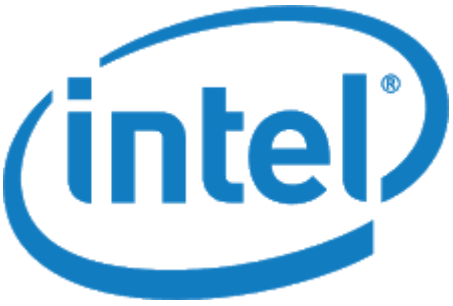
	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Toyota

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Samsung

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○



Intel

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Bank of America

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Shell

	1	2	3	4	5
It makes sense to me that this brand sponsors this type of game.	○	○	○	○	○
The sponsor brand and the game type fit together well.	○	○	○	○	○
The brand and the main game features have similar images.	○	○	○	○	○
The ideas I associate with the brand are related to the ideas I associate with the game.	○	○	○	○	○
Other brands in this industry fit the game as well.	○	○	○	○	○

Annex B – Main Survey

Title: Garry's Mod DarkRP

Please answer the following questions regarding your experience while playing on the server. All rewards will be given out by the developer once he's contacted. Thank you for your help!

SteamID/Profile:

_____

Sex:

○ Male

○ Female

○ Prefer not to say

Age:

_____

Location:

Select ▼

Do you recall seeing advertisements (brand logos) while playing?

○ Yes

○ No

(If no is selected, the next question is skipped)

Which brands do you recall encountering while playing?

_____

Can you identify the logo of any of these brands?

	Yes	No	I don't know
Toyota	○	○	○
Ford	○	○	○
Intel	○	○	○
Dell	○	○	○
Lays	○	○	○
Doritos	○	○	○
Pepsi	○	○	○
Mountain Dew	○	○	○
Red Bull	○	○	○
Monster Energy	○	○	○

Which product categories appeared in the game environment as advertisements?

	Yes	No	I don't know
Car Manufacturers	○	○	○
Health	○	○	○
Wine, Beer & Liquor	○	○	○
Music Production	○	○	○
Computer Technology	○	○	○
Real Estate	○	○	○
Tobacco	○	○	○
Clothing Manufacturing	○	○	○
Food & Beverage	○	○	○
Textiles	○	○	○

Which brands appeared in the game environment? *

	Yes	No	I don't know
Toyota	○	○	○
Ford	○	○	○
Intel	○	○	○
Dell	○	○	○
Lays	○	○	○
Doritos	○	○	○
Pepsi	○	○	○
Mountain Dew	○	○	○
Red Bull	○	○	○
Monster Energy	○	○	○

Which advertisements do you remember encountering while in-game?

	Yes	No	I don't know
Advertisement 1	○	○	○
Advertisement 2	○	○	○
Advertisement 3	○	○	○
Advertisement 4	○	○	○
Advertisement 5	○	○	○
Advertisement 6	○	○	○
Advertisement 7	○	○	○
Advertisement 8	○	○	○
Advertisement 9	○	○	○
Advertisement 10	○	○	○

Rate the listed brands with the following scales:

Mountain Dew

	1	**2**	**3**	**4**	**5**	
Unimportant to me	○	○	○	○	○	Important to me
Means nothing to me	○	○	○	○	○	Means a lot to me
Useless to me	○	○	○	○	○	Useful to me

Doritos

	1	**2**	**3**	**4**	**5**	
Unimportant to me	○	○	○	○	○	Important to me
Means nothing to me	○	○	○	○	○	Means a lot to me
Useless to me	○	○	○	○	○	Useful to me

Dell

	1	**2**	**3**	**4**	**5**	
Unimportant to me	○	○	○	○	○	Important to me
Means nothing to me	○	○	○	○	○	Means a lot to me
Useless to me	○	○	○	○	○	Useful to me

Intel

	1	**2**	**3**	**4**	**5**	
Unimportant to me	○	○	○	○	○	Important to me
Means nothing to me	○	○	○	○	○	Means a lot to me
Useless to me	○	○	○	○	○	Useful to me

Annex C – Model 1 (Recall) Outputs

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	379	100,0
	Missing Cases	0	,0
	Total	379	100,0
Unselected Cases		0	,0
Total		379	100,0

a. If weight is in effect, see classification table for the total number of cases.

Classification Table

Observed			Predicted		
			Recall.Unaided		Percentage Correct
			0	1	
Step 0	Recall.Unaided	0	201	0	100,0
		1	178	0	,0
	Overall Percentage				53,0

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	36,721	4	,000
	Block	36,721	4	,000
	Model	36,721	4	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	487,288[a]	,092	,123

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Classification Table

Observed			Predicted		
			Recall.Unaided		Percentage Correct
			0	1	
Step 1	Recall.Unaided	0	127	74	63,2
		1	63	115	64,6
	Overall Percentage				63,9

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AdSize(1)	,1215	,2458	,244	1	,621	1,129
	AreaPopulation	,0005	,0001	13,710	1	,000	1,001
	TimesSeen	,0023	,0012	3,924	1	,048	1,002
	Involvement	,2293	,0821	7,800	1	,005	1,258
	Constant	-1,8594	,4282	18,858	1	,000	,156

a. Variable(s) entered on step 1: AdSize, AreaPopulation, TimesSeen, Involvement.

Annex D – Model 2 (Recognition Industry) Outputs

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	804	100,0
	Missing Cases	0	,0
	Total	804	100,0
Unselected Cases		0	,0
Total		804	100,0

a. If weight is in effect, see classification table for the total number of cases.

Classification Table

			Predicted		
			Recognition.Industry		Percentage Correct
	Observed		0	1	
Step 0	Recognition.Industry	0	0	361	,0
		1	0	443	100,0
	Overall Percentage				55,1

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	64,941	4	,000
	Block	64,941	4	,000
	Model	64,941	4	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1041,262[a]	,078	,104

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Classification Table

			Predicted		
			Recognition.Industry		Percentage Correct
	Observed		0	1	
Step 1	Recognition.Industry	0	182	179	50,4
		1	118	325	73,4
	Overall Percentage				63,1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AdSize(1)	,1598	,1710	,874	1	,350	1,173
	AreaPopulation	,0001	,0001	2,260	1	,133	1,000
	TimesSeen	,0059	,0015	16,151	1	,000	1,006
	Involvement	,2647	,0527	25,242	1	,000	1,303
	Constant	-1,1541	,2717	18,037	1	,000	,315

a. Variable(s) entered on step 1: AdSize, AreaPopulation, TimesSeen, Involvement.

Annex E – Model 3 (Recognition Brand) Outputs

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	726	100,0
	Missing Cases	0	,0
	Total	726	100,0
Unselected Cases		0	,0
Total		726	100,0

a. If weight is in effect, see classification table for the total number of cases.

Classification Table

			Predicted		
			Recognition.Brand		Percentage Correct
	Observed		0	1	
Step 0	Recognition.Brand	0	0	361	,0
		1	0	365	100,0
	Overall Percentage				50,3

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	38,946	4	,000
	Block	38,946	4	,000
	Model	38,946	4	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	967,481[a]	,052	,070

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Classification Table

			Predicted		
			Recognition.Brand		Percentage Correct
	Observed		0	1	
Step 1	Recognition.Brand	0	214	147	59,3
		1	140	225	61,6
	Overall Percentage				60,5

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AdSize(1)	,0458	,1741	,069	1	,792	1,047
	AreaPopulation	,0003	,0001	6,955	1	,008	1,000
	TimesSeen	,0029	,0011	7,763	1	,005	1,003
	Involvement	,1782	,0551	10,463	1	,001	1,195
	Constant	-1,0738	,2821	14,492	1	,000	,342

a. Variable(s) entered on step 1: AdSize, AreaPopulation, TimesSeen, Involvement.

Annex F – Model 4 (Recognition Ad) Outputs

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	721	100,0
	Missing Cases	0	,0
	Total	721	100,0
Unselected Cases		0	,0
Total		721	100,0

a. If weight is in effect, see classification table for the total number of cases.

Classification Table

			Predicted		
			Recognition.Ad		Percentage Correct
	Observed		0	1	
Step 0	Recognition.Ad	0	0	356	,0
		1	0	365	100,0
	Overall Percentage				50,6

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	33,071	4	,000
	Block	33,071	4	,000
	Model	33,071	4	,000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	966,335[a]	,045	,060

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,000.

Classification Table

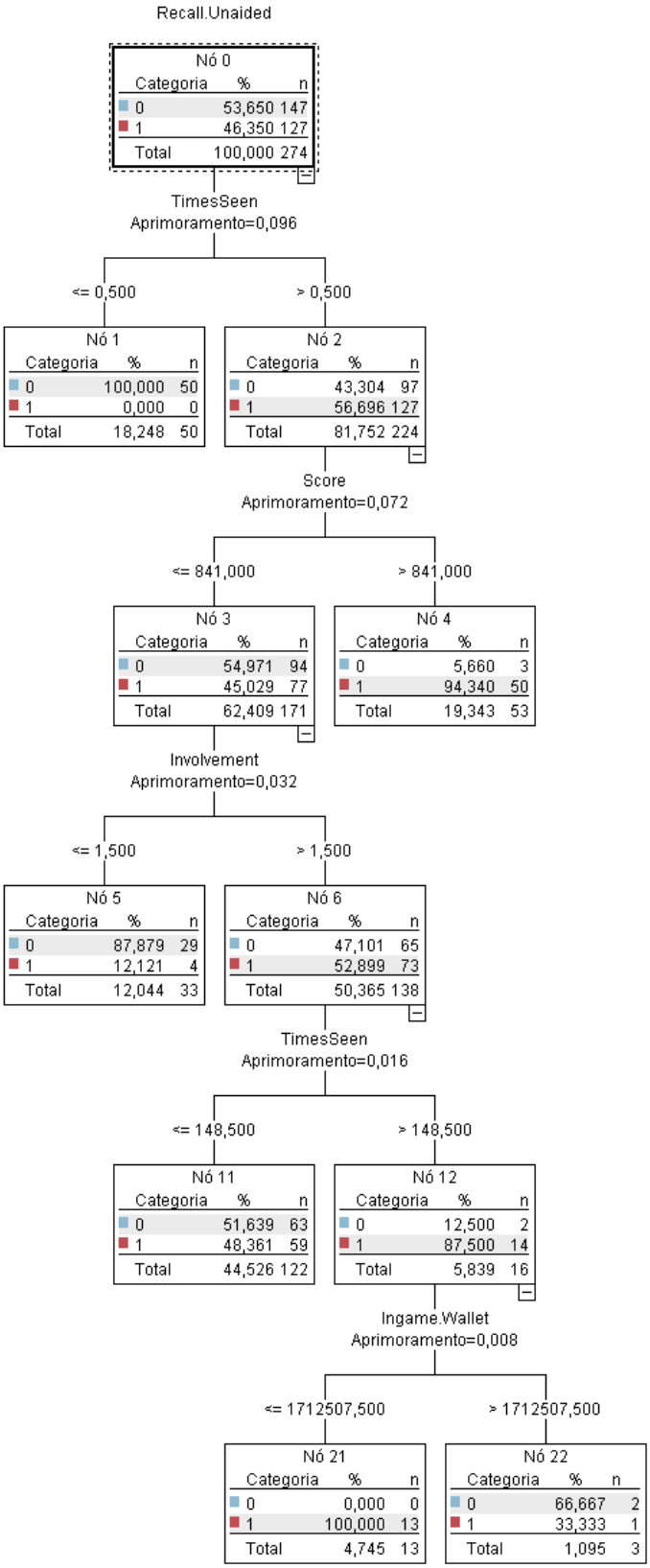
			Predicted		
			Recognition.Ad		Percentage Correct
	Observed		0	1	
Step 1	Recognition.Ad	0	215	141	60,4
		1	134	231	63,3
	Overall Percentage				61,9

Variables in the Equation

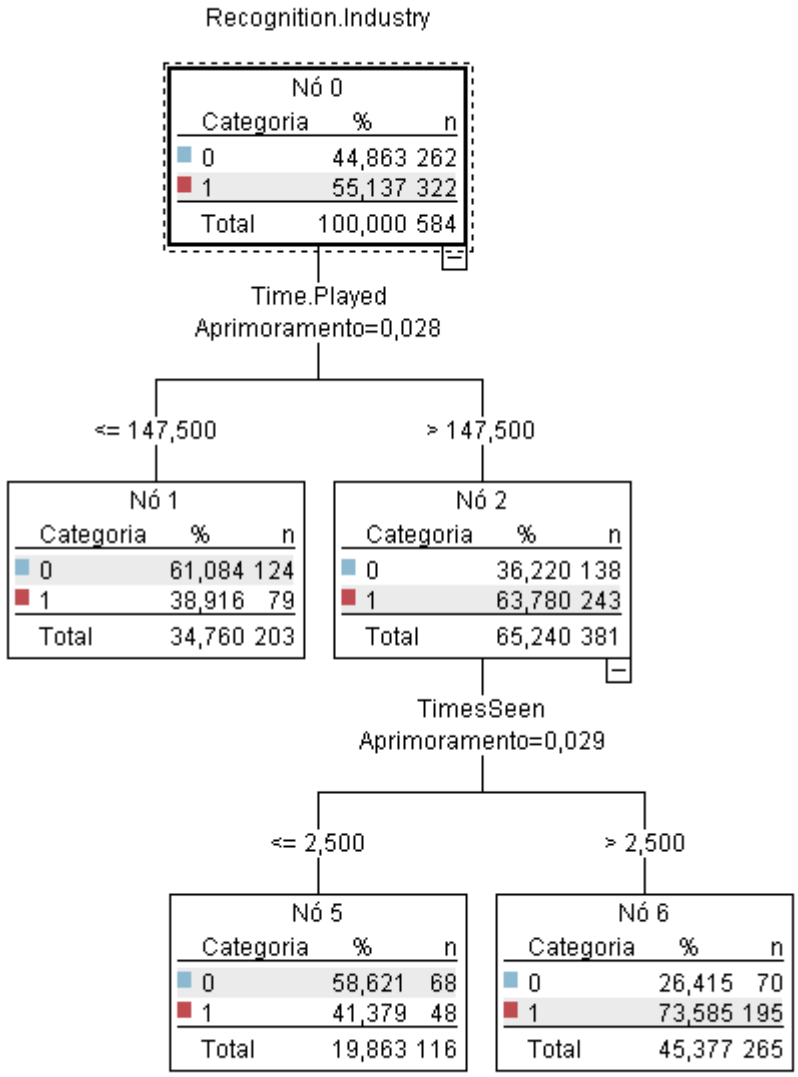
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AdSize(1)	,0467	,1726	,073	1	,787	1,048
	AreaPopulation	,0002	,0001	6,037	1	,014	1,000
	TimesSeen	,0026	,0010	6,825	1	,009	1,003
	Involvement	,1687	,0539	9,790	1	,002	1,184
	Constant	-1,0065	,2821	12,727	1	,000	,365

a. Variable(s) entered on step 1: AdSize, AreaPopulation, TimesSeen, Involvement.

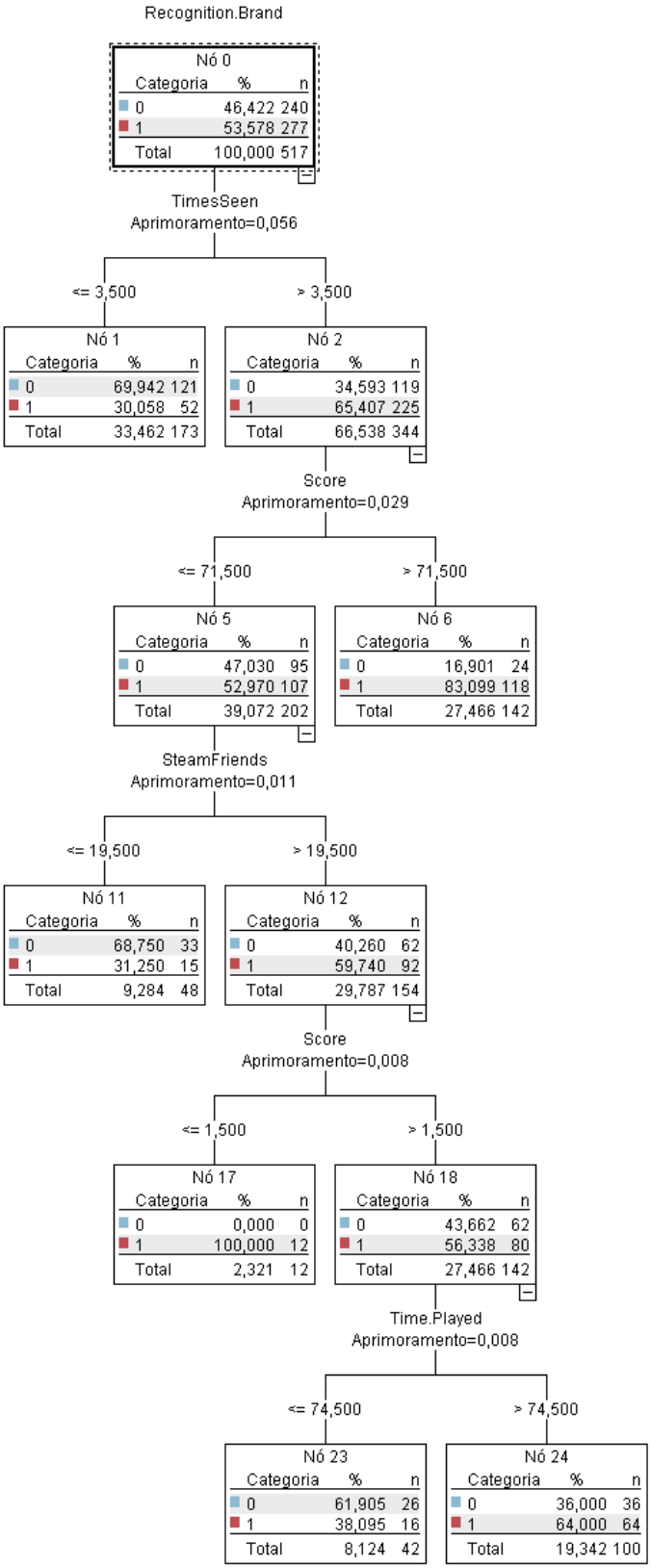
Annex G – Decision Tree (Recall) Outputs



Annex H – Decision Tree (Recognition Industry) Outputs



Annex I – Decision Tree (Recognition Brand) Outputs



Annex J – Decision Tree (Recognition Ad) Outputs