

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL

**ANALYZING PLAYER ENGAGEMENT IN
WESTERN ACTION ROLE PLAYING GAMES
USING USER REVIEWS AND ACHIEVEMENTS**



M.Sc. THESIS

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Department of Game and Interaction Technologies

Game and Interaction Technologies Programme

JANUARY 2022

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**STEAM KULLANICI İNCELEMELERİNİ VE KAZANIMLARINI
KULLANARAK BATILI AKSİYON ROL YAPMA
OYUNLARINDA OYUNCU ETKİLEŞİMİNİN ANALİZİ**

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To my love of video games,



FOREWORD

I would like to thank my parents for providing me with the best possible opportunities to get to this point where I can learn and hopefully teach others in my favourite art form of digital video games. I would like to thank my thesis advisors Tolga Ovatman and Kutay Tinç for their patience and guidance. I would like to thank Istanbul Technical University for providing an environment for students to learn more about game design and technologies. I would like to thank my superior from BAU Güven Çatak for allowing me to focus on my thesis studies with his support.

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ABBREVIATIONS

NPC	: Non-playable character
NLP	: Natural Language Processing
RPG	: Role-Playing Games
WRPG	: Western Role-Playing Games
JRPG	: Japanese Role-Playing Games
CRPG	: Computer Role-Playing Games
ARPG	: Action Role-Playing Games
PENS	: The Player Experience of Need Satisfaction Questionnaire
GEQ	: The Game Experience Questionnaire
GEnQ	: Game Engagement Questionnaire
EQ	: The Engagement Questionnaire
STD	: Self-Determination Theory
IMI	: Intrinsic Motivation Inventory
CDPR	: CD Projekt RED
DRM	: Digital Rights Management
UX	: User Experience
ABSA	: Aspect Based Sentiment Analysis
D&D	: Dungeons & Dragons
k-NN	: k-nearest neighbors algorithm



SYMBOLS

X_i, X_1 : Game Inputs





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ANALYZING PLAYER ENGAGEMENT IN WESTERN ACTION ROLE PLAYING GAMES USING USER REVIEWS AND ACHIEVEMENTS

SUMMARY

User reviews are one of the leading factors of judging player engagement and popularity of digital video games. They not only provide sentimental feedback but also give insight on what the player likes or dislikes about a product. However, it is confusing to see this segment not reflected in tools of player engagement such as game achievements. Game achievements provide objective data related to the successes of a player in terms of engagement. We believe we can compare these two user outputs to create a correlation between what players say and what players do in relation to player engagement. A sentiment analysis can be done using the frequency of words used in reviews and review recommendation to understand why players use the words they use.

In this thesis we will be focusing on western action-based role-playing games, comparing Steam user reviews with Steam achievements by categorizing each based-on type, and consistency. Game achievements will be categorized based on player experience, engagement, and enjoyment aspects. User reviews will be ran through a stemmed word frequency query, manually selected and divided between predefined categories. Data gathered from these categorizations, such as word count and completion rate was then compared with reviewer recommendations to analyze the sentiment regarding each defined player engagement aspect. Furthermore, k-nearest neighbors algorithm (k-NN), a non-parametric classification model, was used to create review recommendation level clusters to analyze and player reviews for other games of this genre.

In conclusion, we have found that a correlation between frequency of words used by reviewers and average achievement unlock rates of games can be made. We have also noticed correct applications of different aspects of game engagement may have an impact on the other aspects, as a game with engaging gameplay might lead to lower rates of game completion while a poor implementation of exploration mechanics that lack engagement can lead to increased game completion rates. We have also found the correlation between our two main datasets can be used to create a classification model to analyze review sentiment rates of other games moving forward.

Going forward, more research on different video game titles or genres might be necessary for understanding why increased success in one aspect of engagement leads to decreased interest on other fields.



STEAM KULLANICI İNCELEMELERİNİ VE KAZANIMLARINI KULLANARAK BATILI AKSİYON ROL YAPMA OYUNLARINDA OYUNCU ETKİLEŞİMİNİN ANALİZİ

ÖZET

Bilgisayar oyunu medyumun interaktif yapısı ile anlatılan hikayeler hikayeyi ilerleten karakterleri ve hadiseleri kontrol eden oyuncuyu video oyunlarının uçsuz bucaksız dünyasına davet eder. Oyuncular oyun dünyasını keşfetmeye, oyun dünyası ile etkileşime girmeye ve anlatılan hikayeleri ve anlatan karakterleri önemsemeye teşvik edilmektedirler.

Bir oyunu oynarken oyuncunun geçirdiği bütün deneyimlerin toplamına oyuncu deneyimi adı verilir. Ancak asıl deneyim oyun başlamadan çok önce başlar. Oyuncunun oyun ile alakalı izlediği videolar, okuduğu yorumlar ve oyunu satın alma süreci oyuncunun bir oyunla yaşadığı deneyimin bir parçasıdır. Detaylı bir şekilde planlanmış bir oyuncu deneyiminin sonucu sağlam oluşturulan oyuncu etkileşimidir. Bir oyunun bu oyuncu etkileşimine sahip bir oyun olması hem oyuncu hem de geliştirici için önemlidir. Oyuncu deneyimleri psikolojik, davranışsal ve fizyolojik seviyelerde ayırt edilirler.

Bir oyuncunun oyun oynama isteğinin temelinde o oyuna dalmak ve bağlanmak yatmaktadır. Oyuncu etkileşimi bu terimleri kapsar. Başarılı bir oyuncu etkileşimi yaratmak bir oyuncuya o etkileşimi yaşatır, bir oyun tasarımcısının daha başarılı oyunlar yaratmasını sağlar, ve bir oyunun hem ekonomik olarak başarılı olmasını hem de oyuncuların gözünde olumlu bir bakış açısına sahip olmasını sağlar. Bilgisayar oyunları oyuncuyu içine çeker, oyun deneyimine tutkal gibi yapıştırır ve oyunamaya devam etmelerini sağlar.

Oyuncu deneyiminin sayılara dökülmesi üzerine çok sayıda akademik çalışmalar yapılmıştır. PENS ve GEQ bu konuda kullanılan anketlerin önde gelenleridir. Özerklik teorisi (STD) ve benzer teorilerden geliştirilen PENS oyuncu deneyimini yeterlilik, özerklik, alakalılık, sezgisel kontroller ve duruş üzerinden değerlendirir. PENS'in kullanımı oyun satışları, oyun serisine bağlılık, ilgi süresi, pozitif etki ve zevk ile ilişkilendirilmiştir. GEQ ise oyuncu etkileşimi ölçümü için oluşturulmuş bir anket olup oyunculardan oluşturulan odak gruplarına yedi farklı faktörde odaklanır: pozitif etki, negatif etki, hayal kırıklığı, akış, mücadele, oyuncuyu içeri çekme, ve yeterlilik.

Oyuncunun oyuna katılımı, oyun akışı, oyundaki duruşu ve oyunun içine çekilmesi oyuncu etkileşiminin temellerini oluşturur. Oyun ile etkileşimde olan bir oyuncu oyuna meraklıdır ve oynamaya devam etmek ister. Akış olarak da tanımlanan şekilde, oyuncu oynama deneyiminde sadece bu deneyim için kendisini tutmak ister. Akışın ölçülmesi için bir oyunun esas önemi, oyuncunun merak hissi ve kontrol algısı ele alınır. Bu değerlendirmeler oyunları hikaye, keşif ve oynanış üzerinde kategorilendirilebilir.

Bilgisayar tabanlı rol yapma oyunlarında oyunun statik hikayesini oyuncu deneyimini kişiselleştirerek geliştirmek için yapılan araştırmalarda oyuncu etkileşiminin içerikleri

olan oyunun oyuncu aksiyonlarına adaptasyonu, oynanamayan karakterler ile gösterilen oyuncu varlığı, ve oyuncuyu karakteri düşünülerek dengelenme ile oyuncuya kontrol hissi sağlaması önerilmektedir.

Oyunculara yüksek skor kazanmayı sağlayan oyunlardan beri oyuncu başarımları oyunların bir paçası halindedir. Oyuncuların oyun içinde başarılarının oyuncuyu ödüllendirilmesi ve dışsal motivasyon olarak kullanılması olan oyun başarımları oyun tasarım öyelerinin oyun-dışı alanlarda kullanıcıya motivasyon sağlama ve problem çözmeye teşvik etme yöntemi olan oyunlaştımanın oyunlarda kullanılmasının örneklerinden biridir. Günümüzde oyunların dijital satış platformlarında yer alması için bu başarımlara sahip olması gerekmektedir. Bu başarımlara bakarak oyuncular hem kendi oyundaki başardıklarını görebilir hem de bu başarılarını diğer oyuncular ile karşılaştırabilirler. Oyun başarımları oyuncunun oynanış tarihinin bir kaydı ile bize oyuncu deneyiminin bir özetini sağlamaktadır. Bu özet oyun geliştiricilerine ve oyun dalında araştırma yapanlara oyuncunun oyunda yaptıkları ile alakalı nesnel geri dönüş sağlar.

Oyundaki başarımların tamamlanması bazı oyuncular için başlı başına bir hedef haline gelebilir. Bu başarımlara ulaşmak için oyuncular normal oyun deneyiminde denemeyecekleri oynanış stillerini kullanmaya yönelebilirler. Bazı oyun serilerinde oyuncuların başarımları o serideki devam oyunlarını oynamalarına motivatör olarak kullanılabilir ve bazı oyun serilerinde bir oyundaki başarımlar devam oyunlarını etkileyecek şekilde tasarlanmaktadır.

Oyuncu başarımları farklı şekillerde tasarlanabilir. Bazı başarımlar oyunun oynanmasıyla açılabilirken bazı başarımlar oyunun zorluk seviyelerine bağlıdır. Diğer başarımlar ise oyuncuların oyun dünyasını veya oyun mekaniklerini keşfetmelerini teşvik eder. Son olarak bazı başarımlar oyuncuların oyun veya hikayede yaptıkları seçimlere bağlıdır. Başarımlar aynı zamanda oyuncuları aynı oyunu birden fazla kere oynamalarına teşvik eder. Oyuncuya sunulan başarımların çeşitliliği oyuncuların deneyimini ve motivasyonunu geliştirebilir.

Oyun başarımları ile alakalı araştırmalarda başarımların oyuncu motivasyonuna ve performansına etkisine bakılmaktadır. Oyun başarımları zamanla oyuncuların özerklik, sonlama ve yetenek ihtiyaçlarını hedef ayarlamadan daha iyi bir şekilde karşılayabilir.

Oyuncu yorumları oyunların popülerliğini ve oyuncunun oyunlar ile etkileşimini değerlendirmede önde gelen faktörlerden biridir. Tanıtım videoları ve oyun kutusundaki kapaklar dışında, oyuncuların bir oyunla ilk etkileşimlerinin başında oyun yorumları gelmektedir. Profesyonel oyun yorumcuları ya da diğer oyuncular tarafından verilen oyun skorları oyuncuya seçtikleri oyun ile alakalı bir beklenti ve anlayış sağlar. Profesyonel oyun yorumcuları ile bir oyunun aktif oyuncuları yorumlarında farklı noktalara odaklanır. Profesyonel oyun yorumlarının oyunların satış sayılarında etkisi gözlemlenebilirken aynı etki oyuncuların bıraktığı yorumlarda görülmemektedir. Fakat oyun geliştiricileri oyuncu deneyimini mükemmelleştirmek için oyuncu yorumları kullanmaktadır. Oyuncu yorumları Oyuncular ile alakalı duygusal geri dönüşler sağlamanın dışında oyuncuların bir ürün ile alakalı beğeni ve beğenmemeleri ile alakalı bize anlam sağlamaktadır. Oyuncu yorumları bize oyunlar ile alakalı öznel veri sağlamaktadır.

Dijital oyun dağıtım platformu Steam kullanıcılarına sahip oldukları oyunlar ile alakalı halka açık yorumlar bırakma imkanı sağlamaktadır. Bu yorumlarda kullanıcılar oyunla alakalı yorumlarını ve oyunu satın alma konusunda tavsiyelerini paylaşabilirken, bu

yorumu okuyan diğer oyuncular bu yorumcunun oyunu oynama süresini, sahip oldukları oyun sayısını ve toplamda yaptıkları yorum sayısını görebilir, aynı zamanda bu yorumun yardımcı veya komik oldukları ile alakalı eleştiri bırakabilirler.

1970'ten beri bilgisayar oyunları sağladıkları el-göz koordinasyonu, yönetim becerileri ve hikaye anlatımı deneyimleriyle tür adı veriler kategorilere ayrılmaktadır. Kalem ve kağıt ile oynanan oyunlar olarak başlayan rol yapma oyunları (RPG) bilgisayar karşılıklarının temellerini oluştururlar. Bu türdeki oyunlar oyuncu ve düşöam karakterler için kurallara ve istatistiklere sahiptir. Bu türün hem kağıt ve kalem versiyonlarında hem de bilgisayar yapımı versiyonlarında oyuncuların takip etmeleri için görevler bulunmaktadır.

Aksiyon rol yapma oyunları (ARPG) el-göz koordinasyonu odaklı aksiyon oyun türüyle kağıt ve kalem temelli rol yapma oyunlarının kombinasyonundan oluşan alt türe verilen isimdir. ARPG en yaygın olarak oyuncunun görevler ve çarpışma konumları arasında dolaşmalarını sağlayan bir açık dünya ve oyuncu karakterini oyuna bağlayan ve bütün oyunu kapsayan bir hikaye içerir. Batılı ve doğulu (özellikle Japon yapımı) rol yapma oyunları oyuncu karakter oluşturma, hikaye anlatımı ve sanatsal tarzları gibi bölgesel farklılıklar içerir.

Bu çalışmada aksiyon rol yapma oyunlarında oyuncu etkileşiminin ölçümü için nesnel oyuncu başarımları ile öznel oyuncu yorumları karşılaştırılmaktadır. Bu karşılaştırma sayesinde bu iki faktör arasında bir ilişki olup olmadığını kontrol edilmiştir. Ayrıca bu iki faktörün ilişkisi ile oyuncu etkileşimi arasında bağlantı oluşturulmuştur.

Bu hedeflere ulaşmak için öncelikle kullanılacak oyunlar belirlendi. Seçilen oyunların güncelliği için son 10 yıl içinde yapılmış olması, oyunların Steam üzerinde başarımları ve 500'den fazla yorumları olması gerekmektedir. Bu çalışmada oyuncu deneyimi ve etkileşimi ile alakalı üzerinde durduğumuz gruplaştırmaya uygunluğu nedeniyle ARPG oyunları seçildi. Oyunlar seçildikten sonra bu oyunların Steam platformunda bulunan başarımları toplandı. Eksik olan başarımlar bilgileri eklenerek bu başarımlar kategorilere ayrıldı. Sonrasında yine Steam üzerinden yapılan yorumları taranarak bu yorumların kullanıcı adı, tarihi, tavsiye durumu ve içeriği gibi bilgileri toplandı. Bu yorumlar NVivo 12 programında geçirilerek bu yorumlarda kullanılan kelime ve terimlerin sıklığı tarandı. Bu kelimelerden NVivo'nun özelliklerinden biri olan noktalar yaratıldı ve bu noktalar oyunun sahip olduğu başarımlar kategorilerine göre kategorilendi. Bu iki temel faktör için oluşturulan kategorilerin ortalamaları alınarak sonuç verilerine ulaşıldı. Araştırmanın parçası olan oyunların başarımlar ve yorum verileri parametrik olmayan sınıflandırma yöntemi olan k-en yakın komşu algoritması (k-NN) kullanılarak aynı türdeki bir oyunun oyuncu başarımları ve yorumları kullanılarak beğeni seviyesini öngörmeyi sağlayacak kümeler oluşturuldu.

Bu araştırma ile oyuncuların kazandığı başarımların oyuncuların yorumlarda kullandığı başlık kelimelerinin sıklığının benzerlik gösterdiği ve bu benzerlik ile oyuncu etkileşiminin belirli oyunlarda hangi şekilde oluştuğunu anlanılabileceği bulundu. Bunun dışında bu veriyi kullanarak aynı türdeki başka oyunların oyuncu gözünde başarı oranını öngörme denemesi yapıldı. Konu ile alakalı gelecekte yapılabilecek araştırmalar için oyuncu etkileşimini daha iyi anlamayı sağlayacak bir temel atıldı. Ayrıca bu oyunlar için oyuncu yorumlarının duygusal analizi yapılarak oyuncuların fikirleri üzerinde daha detaylı araştırma yapılabilir.



1. INTRODUCTION

Games are meant to be completed. Stories told and presented in the interactive narrative of digital video games asks the player, the user controlling the events and characters which progress the story, to invite themselves into the vast world of the video games. The player is encouraged to explore, to interact and to care about the stories told and the characters who tell them.

Solid player engagement is the preferred result of a structured player experience as an engaging game is important for both the players and the developers. Players desire for playing a game is to be immersed and engaged in the experience they've paid for and game developers want to present this experience on the factors of successful sales and merit. A game designer correctly analysing player engagement can design better, more successful games. Successful player engagement benefits the video game itself through economic success and creating a favorable view in the eyes of gamers.

Player engagement has been a topic of research for some time with many factors debated in how to describe and analyze it. Multiple approaches have been used and different questionnaires have been created in order to assess player engagement of a game or a game environment correctly. It is still a popular topic in academia focusing on game design and impact of video games.

Player engagement includes factors such as immersion, flow, presence, etc which are discussed on psychological, behavioral and the physiological levels. Being a motivating factor of the player experience, successful analysis of player engagement impacts all types of games ranging from commercial to educational to serious games. Analysing player engagement can lead to producing new breakthroughs on designing games as well as understanding the triumphs and failures of currently available titles.

User reviews are useful for potential users and product developers regarding the experience they provide in all fields they are used. They also provide valid, codable datasets for language processing, as well as sentiment and text analysis. A variety of

tools have been created and researched in understanding different aspects of user reviews given their complex and multi-aspect nature.

Gamification is a popular topic in user oriented experiences as user experience designers keep implementing practical implications of game design elements in their works. Gamification is used in improving user experience and user engagement in different applications, activities, and services. So it is not surprising to see them being used back in experiences where they first originated in the form of game achievements. They are effective in motivating players for their actions as well as comparing their player experience to other players. For academic studies achievements are a tool in measuring engagement and effective application of game elements. They provide a direct data of player's actions for use in game analysis, player analysis, both on an individual level and group level, and player engagement.

For western generated games in the action role playing genre; story, game/combat flow, and exploration play a major role in players' perception and reactions. As the digital counterpart of pen-and-paper role playing games like Dungeons & Dragons, they present the player with unique and different worlds for them to explore and become a part of. Players have an expectation of engaging experiences as they want to be immersed throughout their experience.

Looking through user reviews found in Metacritic and Steam, players will express their enjoyment of storylines and characters as much as their gameplay experience with combat, choice, and exploration mechanics in these games. The achievement records of action role playing games collected from Steam shows us a different story. While the story achievements at the start of games are collected by majority of players, this is not the case for achievements earned later on in the story show a clear case of more than half the player base failing to reach these points of the story and only a mere quarter manages to finish the main storyline. Per user reviews, video games in this genre seem to be engaging enough to pressure them into playing the game, however not engaging enough to finish the experience in its entirety.

In this research, we will be posing questions about how player achievements and user reviews can be used in relation to player engagement of WRPGs as well as how this relationship can help us better understand which elements of a WRPG players reflect positively or negatively to.

We propose comparing biased user reviews with objective game achievement data can give us broad information on which categories of game design these WRPG games succeeded and where they have failed in relation to engaging the player. This engagement would lead the player to complete the game but the success of game aspects in engaging the player can also lead them not wanting to finish the experience entirely as they don't want the experience to be over.

We will be using a method where we will gather user review for aspect based sentiment analysis [1] and achievement data from Steam, a popular game distribution and community platform, and categorizing this data using player engagement aspects. These factors then will be compared to search for any correlation between reviewer sentiment and achievement success rate.

This analysis should bring together detached aspects related to player engagement together to provide a better understanding of engagement in western action role-playing games and how different game design aspects of this genre impact player engagement in regards to playtime and game completion.



2. RELATED WORK

2.1 Player Engagement

Actual experience with a game starts before the actual start of gameplay [2]. It is no secret that correct application of game design creates engaging game experiences as covered in Schoenau-Fog's exploration into the player engagement process of digital games [3]. Video games can draw people in [4], glue the player in the gaming experience [5], and keep them playing [6]. Successful player engagement is one of the core aspects of what a player experiences with a successful application of game design elements [7]. Player experience is the combined aspects of personal experiences of the player. These aspects are distinguished on the psychological, behavioral and the physiological level as intrinsically motivated actions, context constrained action whether symbolic or fictional, being open to procedures and outcomes of the game, presence and immersion to list a few [8].

There have been numerous studies done in the area of quantification of player experience. PENS and GEQ are two questionnaires have been widely used in quantifying player experience as they have proved to be most accurate [9].

The Player Experience of Need Satisfaction Questionnaire (PENS) [10] is a measure developed from the Self-Determination Theory (STD) and similar theories. This questionnaire assesses player experience in the competence, autonomy, relatedness, intuitive controls, and presence/immersion aspects. Usage of PENS have been correlated with experience aspects such as sales, game series loyalty, duration of interest, positive affect and enjoyment. PENS scales include scales for measuring presence aspects including physical, emotional, and narrative [10]. These aspects can be directly correlated with gameplay, exploration, and story aspects of our study.

The Game Experience Questionnaire (GEQ) is another measure developed to measure engagement in digital video games [11]. It explores focus-groups of players and focuses on seven factors; positive affect, negative affect, frustration, flow, challenge, immersion, and competence. GEQ has been used in psychophysiological and social

experience studies and in designing videogames for specific groups of people [12]. The gaming platform the game is played on shows to have an effect on game experience as studied by Aker et al. using a modified version of GEQ, revealing positive responses from players on the PC platform of the same game in comparison to its mobile version [13].

Per a case study by Bostan and Berkman conducted on PlayStation game Horizon: Zero Dawn, the correlation between gameplay elements and latent variables of GEQ was low given it is not optimal to associate a single gameplay factor with a single variable from GEQ [14].

The involvement of a player in the game, as well as flow, presence and immersion create the basis of the concept coined player engagement [15]. Expressed by Brown and Cairns, “An engaged gamer is interested in the game and wants to keep playing” [5]. The player will want stay in the experience of an action of play, simply for its own sake, which is also expressed as flow [16]. One questionnaire developed by Choi and Kim (2004) to measure flow which assessed a game’s intrinsic interest, player’s sense of curiosity, and their sense of control and immersion [17]. These assessments can be correlated with the story, exploration and gameplay aspects in our study respectively.

Similar to experience, immersion also doesn’t require the action of play as discovered by Denisova and Cairns [18]. Players can be immersed into a video game through learning about a feature, creating expectation. In their two studies, Denisova and Cairns found learned aspects of a game (such as difficulty of adaptability to the player) increased immersion and this increase was tied to perceived feeling of such features whether they have been implemented or not.

Guidelines created by Vanhatupa [19] in personalizing player experience for computer based role-playing games (CRPG) suggests improving the static storyline structure of a CRPG can be accomplished by using adaptation (to player actions), presence (of the player represented in NPC reactions), and sense of control (game balancing with the player character in mind), all aspects covered in player engagement.

Player gameplay is highly context-sensitive and effectiveness of traditional models of player engagements need to be investigated further. One such investigation found that hierarchical Bayesian methods are effective in modeling player engagement from comparable contextual data as found by Sawyer et al. in their research [20]. One tool in

analysing the measures of player engagement was developed by Brockmyer et al. and the development process of the Game Engagement Questionnaire (GEnQ) was studied in both classical and Rasch analyses [21]. The structural aspects of computer role-playing games (CRPGs) was highlighted by Sullivan et al. in their game manager (GrailGM) analysis where the aspects we have questioned (story narrative, reliance on combat to institute gameplay, and agency of players in quests and exploration) play factor on the structuring of GrailGM, reinforcing our categorization [22]. Iten et al. also made the correlation between player engagement and choice as meaningful choices have a positive effect. They also used player responses citing previous studies where specific game experiences of players are used in understanding player experiences [23].

The Engagement Questionnaire (EQ) was created by Mayes and Cotton (2001) to specifically measure engagement in video games [24]. Mayes and Cotton found five factors related to engagement in video games which include interest, authenticity, curiosity, involvement, and fidelity. Interest takes into factor a games content and how interesting, appealing, and exciting it is. Authenticity is how controllable and responsive the game is when the player initiates an action, as well as how natural the response of the game is to these actions. Curiosity focuses on the themes of exploration and characters. Involvement is factored in using the focus and playtime of the user. Fidelity is the graphical and mechanical consistency of the game and it is the closest tie-in to the development challenges and the technology of a video game. Factors found in EQ also provide us with similarities to our research categories as interest is created through the story, authenticity with the successful implementation of gameplay and curiosity by the creation of the game environment and encounters. Involvement can also be compared to choice, which is one of our sub-categories.

Looking at the previous research done in player engagement suggests increased engagement can be directly correlated with a player's play-time and their completion of game objectives. This is where achievements come into the equation. We can use achievement completion rates to measure player engagement.

2.2 Achievements

Since Space Invaders could allow players to earn a high-score in 1978, achievements have been part of video games [25]. Used as rewards and extrinsic motivators for

players' in-game accomplishments, video game achievements have been a standing stone of video games, their design and consumption. In fact, collecting statistics of games and scores on different sports, called ludivestigums [25] date back before video games even existed and they would record more statistics outside of just the player's final score. Today games are required to have achievements to be placed in the console libraries of Sony and Microsoft's home entertainment systems [25]. For Playstation Plus, Xbox Live and Steam's game achievements, players can not only see their own list of earned accomplishments, but they can also compare their success with other players around the world. As explored by Salen and Zimmermann in their book *Rules of Play* and expressed by Medler [25] "a player's gameplay history is the recording of a player's experiences."

Completing an achievement list of a game becomes a goal all by itself. Enticing players to certain game styles or actions they might not have planned otherwise. This correlates with research done in goal setting and its effect on effort shown cognitively and behaviorally [26, 27]. In game development there are examples where player achievements are used to develop an increased motivator for players to continue playing the sequels of these games as their achievements and choices are saved in the save game files of the previous games and can be transferred to the sequel and have impact on the sequel's narrative and gameplay as seen in BioWare's *Mass Effect* game series [28].

Achievements vary in type [29-31] as some achievements are straightforward and will be unlocked simply by playing the game. Some achievements will be focused on challenges and difficulty, where players will need to play in an increased difficulty or complete objectives in a more challenging way. Other achievements encourage exploration, requiring players to search the game area for collectible items, side story readings or collection of unique sets of inventories. Lastly, some achievements are based on the story choices made by the player, rewarding and differentiating the player from others for the choices they made in their game, sometimes encouraging multiple playthroughs of the same game to secure these achievements. Achievements are also varied in whether a player is expecting an achievement to appear (expected vs unexpected), whether the achievement is incremental to the players progression (incremental vs non-incremental), whether the players were notified of their achievements during play (during vs after), and the combination of these three varieties

(combined achievement) [29]. Results show that a combined achievement has the most possible impact on player engagement.

Effects of motivation and performance have been investigated by Groening and Binnewies [32] as achievements are gamification elements (which are game design elements of video games used in a non-game context [33]) used to reinforce player engagement during the act of play itself. It is suggested that achievements can satisfy the needs of autonomy, closure and ability even more than goal-setting over time [32].

Effects of video game achievements has been measured by Johnson et al. [34]. Using the Post-experimental Intrinsic Motivation Inventory (IMI) the subjective, physiological experiences and perceived tension and effort of players were questioned, and the diversity of rewards was found to improve player experience and motivation.

Regarding increasing the player engagement in the terms of longevity and play time, as covered by Park et al. [35], it is found that although achievements important for players initially, social features are more useful in predicting longevity, especially in multiplayer games.

2.3 User Reviews

Outside of game trailers and disc covers, one of the very first interactions of a gamer with a video game is a game review. Game reviews create a lens for how that game should be viewed. Whether from a renowned publication or from the combination of user reviews, the resulting aggregate score of a game from either 0 to 10 or 0 to 100 will be the first criticism of a video game. These scores and reviews both create an expectation and an understanding for the players of what they will get from this game. Video game reviews have an impact on the sales and the future funding of games, which was expressed publicly by game publishers in the past [36, 37]. Video games themselves saw evolutions and improvements in the form of post-release game updates on account of negative user reviews. One example being the 2016 indie game No Man's Sky starting its post-release lifecycle with overwhelmingly negative reviews, taking feedback from these reviews and publishing free game updates until in 2020 where No Man's Sky won The Game Award for 'Best Ongoing Game' while having a Steam review rating of 'Mostly Positive' from one hundred and seventy thousand plus owing to their support for the betterment of the game post launch[38]. Extremely

positive or negative user reviews of video games can also create a perception on the gaming zeitgeist as can be seen in the massive refunds of CD Projekt Red's Cyberpunk 2077 and gaining infamously negative perception as a broken game[39, 40].

Research shows that while professional reviews of video games have an impact on the sales numbers of a game, same can't be said for user (peer) reviews of these goods [36]. However, developers do work with the end user to maximize player experience and engagement in their games as explored by Patrick Stafford in an article with polygon.com [41]. User experience professionals quoted in this article also mention how the aspects of experience they focus on diverge from the basic expectations of users stated in user reviews. Meaning correct focus on aspects important to players is important and can be much easily understood by looking through user reviews.

As discussed by Johnson et al. what professional reviewers (critics) and active users focus while reviewing a game varies [32]. Aspects critics focus on have been categorized by Zagal et al. as description, personal experience, reader advice, design suggestions, media context, game context, technology, design hypotheses, and industry [42]. In the same research it shows that users who decide on reviewing a game are more passionate about the product whether because of positive or negative reasons, judging the game design choices or bugginess of a product while critics focus on aspects such as accessibility as they themselves provide a product to their end user readers. These findings are later reinforced by Santos et al. [43] which support the more emotionally charged tone of user reviews while mentioning how they are more polarized than professional reviews.

Metacritic is an online website where both user and professional critic reviews are published and used in calculation of video game review scores called Metacritic User Score and Metacritic Professional Score respectively. The separate combination of these reviews are used to generate these scores for games. While the professional reviews are weighted (based on critics and publications quality and stature) for the final aggregated Metacritic Professional Score, Metacritic User Score is calculated by using the unweighted average of user reviews. These reviews are presented with the username of the reviewer which users can get by creating a Metacritic user account.

Steam is a digital game distribution platform, developed by Valve Corporation. Steam became one of the largest digital distribution platforms for computer games [44].

Steam's two major components: the Steam Store, and the Steam Community offers users digital rights management (DRM), multiplayer gaming, and social networking services.

Steam client allows players to write public or private (only visible to users in their friends lists) game reviews for any game in their Steam accounts. Players can give a detailed explanation of why they have liked or disliked their selected game to review and remark their opinions with a thumbs up or thumbs down. Other users can reply to these reviews based on whether they've found this review helpful or funny. The reviewers steam username, playtime, their total number of games and total number of games they have reviewed are visible to other users, as well as the percentage of people who found this review helpful or funny. Steam reviews binary definition of whether a review is positive or negative allows us more options in our sentiment analysis.

The previous research on steam user reviews includes an investigation into their helpfulness for other users evaluations of games [45], a simplification of sentiment analysis by creating a classification of plain texts of these reviews using baseline, Naive Bayes, Logistic Regression, and Turney's Algorithms [46], and an empirical study to compare their similarities to mobile app reviews [47].

Metacritic scores and reviews have been used to analyze player experience in the past [48, 49]. For its user base similarity with steam user achievement statistics and its increased possibilities of exploring analysis of an already defined sentiment of these reviews, we've opted in using steam user reviews for this research instead of Metacritic's user reviews.

A study by Lin et al. [47] also used Steam user reviews to understand the similarities and differences between mobile video game user reviews and computer game user reviews. This study was done to verify the validity of using tools in order to improve mobile games in computer games as well. This study also gives us an insight into how playtime impacts Steam user reviews in comparison to mobile games.

Research on user attitudes using game reviews have been done by Strååt et al. in 2017 using Metacritic user reviews for BioWare's Dragon Age and Mass Effect game franchises [50; 51]. Strååt et al. manually analyzed the sentiment of reviewers to generate a method for game developers to question the success or failure of previous titles which could help understand possible changes needed in the design stage of

future games. Their research focused how aspects can be identified through review scores and suggested talking directly with the developers of game in the future to reflect on their findings.

2.4 Action Role-Playing Games

From 1970s, video games have been divided into categories called genres based on whether a game provides an experience focused in either, hand-eye-coordination, management skills, or narrative [52, 53].

Starting as pen and paper games, RPGs (role-playing games) are the foundations of their video game counterparts. Just as the pioneer pen and paper role playing game Dungeons & Dragons [54] these games have set rules for both the player and enemies, as well as statistics for these characters and each include quests for the player to pursue.

Action RPGs are a hybrid of this pen and paper example combined with the hand-eye-coordination focused genre of action games used since 1970 [52]. Players are tasked with killing enemies and bosses (powerful enemy characters) to gain experience in order to improve their playable characters. ARPGs most commonly include an open-world for the player to traverse between missions and combat locations as well as an overarching story which ties the player character to the game world [55]. This game genre also “provides interactive virtual environments capable of offering experiences analogous to real life, it is highly relevant to motivational studies” [56].

The regional differences between western and eastern (specifically Japanese) role playing games have been covered by Matt Barton, stating the ease of access for home consoles of Nintendo and Sega separated Japanese origin role playing games from their western counterparts, which required desktop computers [54]. The accessibility created a separation which was enhanced with the design differences of character creation, story narrative implementation and their arts between two sub-genres [57].

The exact definitions of ARPGs are not a research topic covered enough in academic studies, however comparison of titles tagged ‘ARPG’ or ‘action role-playing’ in their Steam pages and both professional and peer reviews show us these games include and interactive story, an open-world for the player to traverse and start encounters to gain experience points (exp), and a skill tree consisting of options for differing playstyles and player upgrades [58-68].

2.5 Sentiment Analysis

According to Liu, B. opinions can be explained as “is simply a positive or negative sentiment, view, attitude, emotion, or appraisal about an entity or an aspect of the entity” [53]. And as explained by D’Andrea et al. user generated opinions from these entities are useful in decision making for researchers, politicians and service providers and hence it needs to be analyzed [69]. This research topic called sentiment analysis in the field of Information Processing can also be found under the name Opinion Mining. Sentiment analysis gives us information regarding subjectivity and emotion [70].

Sentiment analysis as a term first appeared in [71] but research has been done on opinions before that [72-76]. It is a procedure that has multiple steps in analyzing the sentiment of the given data which are as follows:

1. Data collection: text analytics and NLP are used to extract and classify the data.
2. Text preparation: where the irrelevant data is cleaned from the dataset
3. Sentiment detection: Sentences requiring sentimental expression is kept while objective communication is discarded from the dataset.
4. Sentiment classification: Remaining sentences are divided into groups classified as positive sentiment, negative sentiment, and neutral sentiment.
5. Presentation of output: Data gathered from sentiment classification is returned as meaningful information. This can be presented as text as well as graph via the chosen value (frequency, percentages, and averages).

D’Andrea et al. also provided an overview [77] on multiple points from text classification [76] to sentiment classification [78] and review tools used in sentiment analysis [79]. A review was also conducted by Serrano-Guerrero et al. of free web services with capabilities on analyzing sentiment [80].

Approaches to techniques applied to sentimental analysis are divided between machine learning approaches and lexicon-based approaches. With machine learning approaches there are supervised (support vector machines (SVM), Naïve Bayes, Maximum Entropy [81-83]) and semi-supervised or unsupervised techniques. For lexicon-based approaches there are two subclassifications, being dictionary-based and corpus-based approaches. In dictionary-based approaches collection and annotations of initial terms

are done manually while in corpus-based techniques provide dictionaries generated from opinion terms statistically or semantically.

Sentiment analysis has been used to probe user opinions in game reviews [50, 84], stating how UX designers mention working with the end user in mind, improving game elements such as the game interface [41].

Sentiment analysis has been used in evaluating the usefulness of game-based education [85-87]. Student attitudes about educational games in mathematics classes were analyzed and classified under advantages, disadvantages, classroom use, different aspects, reasons and recommendation. Most students expressed the advantages of game-based education, making abstract topics more concrete [85]. Student attitudes towards game-based skill development have been analyzed using attributes (Effective communicators, Adaptability, Resourcefulness, Limitations), finding while games play an important role in skill development, social interaction facilitated by play is also a significant factor [86]. A study done by Coknaz et al. [87] aimed to evaluate active video games' effect on physical fitness and enjoyment, finding correlating responses for weight and body mass index with data analyzed using NVivo 10, a sentiment analysis tool by QSR International.

3. METHODOLOGY

We are posing the following research questions:

RQ1: Can we correlate user reviews with steam achievement success rates?

RQ2: Can player engagement facets be identified using this correlation?

We will be using Klimmt's model of three dimensions [88] of game enjoyment to categorize achievements into three core categories. These categories will be called story, gameplay, and exploration in correlations we made during our research on player experience and player engagement. We can use achievement completion rates to measure player engagement. We will then be comparing these achievement success rates with user reviews crawled from Steam. We are using an aspect based sentiment analysis (ABSA) [1] as certain aspects of our multi-aspect reviews are used for sentiment analysis. Our review data includes both explicit and implicit data. ABSA was also used in sentiment analysis of user reviews for other ARPGs [50].

From our research we've decided that Western ARPGs provide us with game factors with the correlative similarities to aspects of player engagement as well as our familiarity with Western RPGs in relation to eastern RPGs (mainly JRPGs). From there we have scanned through games tagged ARPG On Steam Store, listing games with achievement features.

To collect Steam user reviews, we've used a tool called Steam Crawler created by GitHub user aesuli [89]. Using this tool, we firstly scanned Steam's entire game database, extracting game id and names. We then separated the games we wanted for this research into another table. Using this table, we've run another code in Steam Crawler to crawl and extract each instances of reviews, including columns of info such as; game id, number of people that found the review to be useful, number of people that found the review to be funny, reviewer username, number of games owned by the reviewer, number of reviews written by the reviewer, reviewer recommendation status (returned 1 for 'recommended' and -1 for 'not recommended'), hours played by the reviewer on the game, review creation date, and the text of the review.

For this research, we will require reviewer usernames to identify instances, recommendation status for broad sentiment analysis of the review and the correlation between recommendation and words used, the review text for our actual keyword analysis, while hours played can be used to compare reviewer playtime and average achievement success rates, and review creation date to understand the sentiment change for the video game after its release cycle in future studies.

Given the sheer number of reviews available for each game, we will be using NVivo 12, a qualitative data analysis tool by QSR International [87]. We are using NVivo as it is one of the more user friendly tools available, as well as being a well-established tool across the social sciences. Using NVivo, user reviews will be scanned and divided into individual instances. These instances will then be put in a word frequency query to find out which words are used the most. At this point using NVivo we will make sure the results won't be bloated with some instances using selected key words more than once. Nvivo's stemmed keyword search will be used in our word frequency query which combined similar words together in results (e.g., talk, talks, talking, talked) as well as typing errors made by reviewers. Searching through the top 500 words used in these instances, relevant keywords will be used to create nodes (codes) and they will be divided between our three main categories; story, gameplay, and exploration. Our review references will then be compared to game recommendation rates of these reviewers using data gained from our Steam review crawl. The total use of words in each category with positive recommendations will then be compared to the average percentage of completion for the corresponding achievement categories.

Achievement percentages were collected manually from games' Steam community pages, available online. Achievement tables were created with rows of achievements included with the game with columns defining the percentage of unlocks for the achievement, achievement name, achievement descriptions, and achievement categories. All achievement descriptions are not available on Steam as secret achievements have their descriptions hidden to avoid spoiling players on story events they haven't unlocked yet. These descriptions have been gathered and manually imputed into our tables via simple google searches. These achievements are then categorized based on Klimmt's model of three dimensions explained before.

Achievements requiring player skill and/or hand-eye-coordination, achievements gained from earning experience points, and achievements earned from compelling the

player to play a certain way or perform unique tasks have been categorized as ‘gameplay achievements’.

Achievements earned by playing the main story missions have been categorized as ‘story achievements’. These achievements are mostly unmissable, meaning the players will earn these achievements simply by playing the game to its completion.

Achievements earned by exploring the open world of the game, achievements gained from collecting hidden or scattered items in the play areas, achievements completed from playing through non-main story related side-quest missions or mission arcs (missions not required to finish the game), and encounters players need to look for have been categorized as ‘exploration achievements’.

Achievements which require a player to make a choice based on story or gameplay which locks them from continuing towards a certain story path or skill tree have been categorized as ‘choice achievements’.

In specific instances for specific games, other categories have been created. These achievements are separated from our core categories because they exist for only that game’s achievement data set. One example can be the Discovery Tour achievements for Assassin’s Creed Origins which are not a part of the main game and are for the virtual museum mode of the game, depicting Ancient Egypt with educational information voiced by characters from the main game. These categories will be explained for each game in their case data tabs.

When compared with the user review analysis, average percentage of achievements completed by category will give us a preview of the level of engagement the game has achieved. Using this method we will be asking whether we can find any causation or correlation between these two streams of data and player engagement.

K-nearest neighbor classification was also used to create clusters based on review rating percentages using the combined data from all the games in our research query. [90] This classification will give us a way to estimate review scores for other games in this genre using achievement rates and review word usage.



4. RESULTS

4.1 Case: The Witcher 3: Wild Hunt

4.1.1 Description

The Witcher 3: Wild Hunt is an action role playing game from Polish game studio CD Projekt RED, as a part of the Witcher franchise based on the novels with the same name from Polish fantasy writer Andrzej Sapkowski. The player takes the role of Geralt of Rivia, a for profit monster hunter known as a Witcher, in search of his adopted daughter amid a war raging throughout the lands. The player takes on missions and fight monsters, creatures and humans alike to gain experience points and gold to improve Geralt's abilities and equipment in their story driven quest. The Witcher 3: Wild Hunt for sits at a 96.55% and an 'Overwhelmingly Positive' review score on Steam.

4.1.2 Achievements

There are a total of 78 achievements in The Witcher 3: Wild Hunt. 52 of these achievements have been a part of the game since its initial release, while 13 have been released with Hearts of Stone, and 13 with Blood & Wine expansions. List of achievements with their Steam unlock percentages can be found in Table 4.1.

Table 4.1 : Achievements of The Witcher 3: Wild Hunt Categorized

%	Achivement Name	Description	Category	Type
65.4	Lilac and Gooseberries	Find Yennefer of Vengerberg.	Story	Vanilla
55.6	Butcher of Blaviken	Kill at least 5 opponents in under 10 seconds.	Gameplay	Vanilla
50.6	Let's Cook!	Learn 12 potion formulae.	Exploration	Vanilla
47	Fist of the South Star	Defeat an opponent in a fistfight without taking any damage.	Gameplay	Vanilla
46.6	Can't Touch This!	Kill 5 foes in a fight without taking damage (except for Toxicity) and without using the Quen Sign.	Gameplay	Vanilla
45.1	Bookworm	Read 30 books, journals or other documents.	Exploration	Vanilla
42.1	Family Counselor	Find the baron's wife and daughter.	Choice	Vanilla

Table 4.1 (continued) : Achievements of The Witcher 3: Wild Hunt Categorized

%	Achivement Name	Description	Category	Type
38.6	Friends With Benefits	Complete the subplot involving Keira Metz.	Exploration	Vanilla
37.3	Bombardier	Collect the formulae for 6 different bomb types.	Exploration	Vanilla
34.9	Shrieker	Complete the contract on the shrieker.	Exploration	Vanilla
34.9	Triple Threat	Kill 3 opponents in one fight using 3 different methods (sword, bombs, crossbow, Signs, etc.)	Gameplay	Vanilla
34.7	A Friend in Need	Find and free Dandelion.	Story	Vanilla
3.3	Environmentally Unfriendly	Kill 50 opponents using the environment (e.g. swamp gas, insects or objects).	Gameplay	Vanilla
32.7	Necromancer	Help Yennefer extract information from Skjall's body.	Story	Vanilla
29.5	Fire in the Hole	Destroy 10 monster nests using bombs.	Gameplay	Vanilla
28.9	Mutant	Fill all mutagen slots.	Gameplay	Vanilla
28.1	Kingmaker	Complete the subplot about choosing Skellige's ruler.	Exploration	Vanilla
27.9	Something More	Find Ciri.	Story	Vanilla
27.8	Globetrotter	Discover 100 fast travel points.	Exploration	Vanilla
27.4	The Doppler Effect	Resolve the doppler problem in Novigrad.	Exploration	Vanilla
26.6	Xenonaut	Visit Tir ná Lia and convince Ge'els to betray Eredin.	Story	Vanilla
26.5	Munchkin	Reach character development level 35.	Gameplay	Vanilla
25	The King is Dead	Defeat Eredin.	Story	Vanilla
24.9	Passed the Trial	Finish the game on any difficulty.	Story	Vanilla
24.2	Fearless Vampire Slayer	Complete the contract on Sarasti.	Exploration	Vanilla
21.9	Ashes to Ashes	Complete the contract on Therazane.	Exploration	Vanilla
21.2	Full Crew	Bring all possible allies to Kaer Morhen for the battle against the Hunt.	Choice	Vanilla
21	I'm Not Kissing That	Kill the prince cursed into a toad.	Story	HoS Ex
20.6	The Witcher's Gone South	Travel to the Duchy of Toussaint.	Story	B&W Ex
19.9	Fiend or Foe?	Complete the contract on Morvudd.	Exploration	Vanilla
19.3	Armed and Dangerous	Find and equip all the elements of one set of witcher gear.	Exploration	Vanilla
18.4	Geralt and Friends	Win a round of gwent using only neutral cards.	Gameplay	Vanilla
18.3	Pacta Sunt Servanda	Finish the "Hearts of Stone" expansion.	Story	HoS Ex
17.3	All In	Play three hero cards in one round of gwent and win the match.	Gameplay	Vanilla
17.1	Assassin of Kings	Take part in the assassination of King Radovid.	Exploration	Vanilla
16.7	Brawler	Defeat Olaf, the Skellige champion of unarmed combat.	Exploration	Vanilla
16.1	Weapon "W"	Develop a mutation.	Gameplay	B&W Ex
14.9	Brawl Master	Complete all fistfighting quests in Velen, Skellige and Novigrad.	Exploration	Vanilla

Table 4.1 (continued) : Achievements of The Witcher 3: Wild Hunt Categorized

%	Achivement Name	Description	Category	Type
14.4	Last Action Hero	Be decorated with the Order of Vitis Vinifera.	Choice	B&W Ex
14.4	Playing House	Use all available options for developing Corvo Bianco.	Exploration	B&W Ex
14.2	Rad Steez, Bro!	Slide downhill uninterrupted for at least 10 seconds.	Gameplay	HoS Ex
14	Woodland Spirit	Complete the contract on the Woodland Spirit.	Exploration	Vanilla
13	Embodiment of the Five Virtues	Be given Aerondight by the Lady of the Lake.	Exploration	B&W Ex
12.5	A Knight to Remember	Obtain a flawless victory in all the competitions during the knights' tourney.	Gameplay	B&W Ex
11.8	Curator of Nightmares	Recreate all of Iris' nightmares in the Painted World.	Story	HoS Ex
11.7	Gwent Master	Defeat Tybalt and win the gwent tournament held at the Passiflora.	Exploration	Vanilla
10.8	Geralt: The Professional	Complete all witcher contracts.	Exploration	Vanilla
10.7	Fast and Furious	Win all the horse races in the game.	Exploration	Vanilla
10.5	Even Odds	Kill 2 monsters you have a contract on without using Signs, potions, mutagens, oils or bombs.	Gameplay	Vanilla
10.4	The Grapes of Wrath Stomped	Help unite the warring vineyards and have wine named in your honor.	Exploration	B&W Ex
9.9	Shopaholic	Buy all the items put on the block at the Borsodis' Auction House.	Exploration	HoS Ex
9.5	Pest Control	Destroy all monster nests in the Velen / Novigrad region, or in Skellige.	Exploration	Vanilla
9.5	Dressed to Kill	Unlock the bonus for equipping all the witcher gear elements from one School.	Gameplay	B&W Ex
9.2	Let the Good Times Roll!	Participate in all the activities at the wedding.	Exploration	HoS Ex
8.1	Turned Every Stone	Find all grandmaster diagrams for each witcher school.	Exploration	B&W Ex
7.2	I Have a Gwent Problem	Collect all the cards in the Skellige deck.	Exploration	B&W Ex
7.1	Wild Rose Dethorned	Destroy all the fallen knights of the Order of the Flaming Rose's campsites.	Exploration	HoS Ex
7	Ran the Gauntlet	Finish the game on the "Blood and Broken Bones!" or "Death March!" difficulty levels.	Challenge	Vanilla
7	Dendrologist	Acquire all the Abilities in one tree.	Gameplay	Vanilla
5.6	Killed It	Win a round of gwent with a total strength of at least 187.	Gameplay	HoS Ex
5.1	Power Overwhelming	Have all possible Place of Power bonuses active at the same time.	Gameplay	Vanilla
4.7	Card Collector	Acquire all gwent cards available in the base version of the game.	Exploration	Vanilla
4.1	Kaer Morhen Trained	Perform 10 effective counterattacks in a row without getting hit or parrying.	Gameplay	Vanilla
3.7	Can Quit Anytime I Want	Be under the influence of seven potions or decoctions at the same time.	Gameplay	HoS Ex
3.6	Walked the Path	Finish the game on the "Death March!" difficulty level.	Challenge	Vanilla
3.5	Return to Sender	Kill 3 opponents with their own arrows.	Gameplay	HoS Ex

Table 4.1 (continued) : Achievements of The Witcher 3: Wild Hunt Categorized

%	Achivement Name	Description	Category	Type
3	That Is the Evilest Thing	Ignite the gas produced by a Dragon's Dream bomb using a burning opponent. Do this 10 times.	Gameplay	Vanilla
2.9	Overkill	Make an opponent suffer from bleeding, poisoning and burning simultaneously. Do this 10 times.	Gameplay	Vanilla
2.7	Kling of the Clink	Serve time in Toussaint.	Choice	B&W Ex
2.7	The Enemy of My Enemy	Use the Axii Sign to force one opponent to kill another. Do this 20 times.	Gameplay	Vanilla
2.5	I Wore Ofieri Before It Was Cool	Collect all available Ofieri armor and horse gear, and at least one Ofieri sword.	Exploration	HoS Ex
2.5	What Was That?	Attack, counter, cast a Sign and throw a bomb (in any order) in under 4 seconds.	Gameplay	Vanilla
2.5	David and Golyat	Kill Golyat with a crossbow bolt to his eye.	Gameplay	B&W Ex
2.4	Moo-rderer	Kill 20 cows.	Gameplay	HoS Ex
2.1	When It's Many Against One...	Provoke all Iris von Everec's Nightmares into fighting you at the same time and defeat them.	Exploration	HoS Ex
1.9	Hasta la Vista™	Kill a frozen opponent with a crossbow bolt.	Gameplay	B&W Ex
1.8	Humpty Dumpty	Kill 10 opponents by knocking them off somewhere high with the Aard Sign.	Gameplay	Vanilla
1.5	Master Marksman	Kill 50 human and nonhuman opponents by striking them in the head with a crossbow bolt.	Gameplay	Vanilla

Our categories for achievements in The Witcher 3: Wild Hunt include story, gameplay, exploration as well as choice, and challenge. There are achievements earned by the players for choosing certain outcomes in story missions. These achievements were categorized as choice achievements. Challenge achievements are the two achievements rewarded to the player for finishing the game on harder difficulty levels. These two achievements are separated from the rest of the gameplay.

The achievement with the highest percentage of unlocks is Lilac and Gooseberries at 65.4%. This achievement is a story achievement. The achievement with the lowest percentage of unlocks is Master Marksman at 1.5%. This achievement is a gameplay achievement. Average unlock rate of achievements for The Witcher 3: Wild Hunt is 18.2%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 11 story achievements, ranging from 65.4% completion and 11.8% completion with an average of 28.08%. There are a total number of 30

gameplay achievements, ranging from 55.6% completion and 1.5% completion with an average of 15.03%. There are a total number of 31 exploration achievements, ranging from 50.6% completion and 2.1% completion with an average of 18.35%. There are a total number of 4 choice achievements, ranging from 42.1% completion and 2.7% completion with an average of 20.1%. There are a total number of 2 challenge achievements, one at 7% completion and the other at 3.6% completion with an average of 5.3%.

The achievement players unlock for finishing the main storyline of the main game is ‘Passed the Trial’, this story achievement has an unlock rate of 24.9%, 3.18% lower than the average percentage for story achievements but 6.7% higher percentage than overall average of achievement completion.

4.1.3 Reviews

We have compiled a list of user reviews for The Witcher 3: Wild Hunt from Steam between 23.04.2021 and 18.09.2021. There are a total of 10620 user reviews made between these dates. 10254 of these reviews are tagged positive for recommendation, giving us a percentage of 96.55% positive sentiment towards the game. Table 4.2 shows the list of nodes created and categorized manually.

Table 4.2 : Coded Words From The Witcher 3: Wild Hunt Reviews

Codes	Extra Descriptors	References
Challenge		726
Challenge	Challenge and challenging	76
Controls	Difficulty in controls	150
Difficult		63
Difficulty	Comments about game difficulty.	150
Easy		145
Grind		83
Hard Mode		59
Choice		433
Choices		293
Dialogue		140
Exploration		4008
Card		153
Discover		52
Environments		79
Exploring	Explore, exploring, exploration	216
Gwent	Optional card mini-game	320
Locations		50
Looting	Loot and looting	95
Map	World Map	137
Novigrad	One of the main cities in the world	55

Table 4.2 (continued) : Coded Words From The Witcher 3: Wild Hunt Reviews

Codes	Extra Descriptors	References
Exploration		726
NPCs	Non-playable characters players can interact with.	108
Places		130
Quests	Side Quests	899
Sex	Related to exploration and side-quests.	72
Side Quests		539
Travel	Fast travel and roaming	68
World		1035
Gameplay		3560
Armors	Items players can loot and equip.	59
Battle	Combat encounters	61
Combat		600
Crafting	As a gameplay mechanic	117
Damage		51
Dodging	Gameplay mechanic	61
Encounters		27
Enemies	Enemy encounters, mechanics and AI	176
Gameplay		507
Gear	Items players can loot and equip	57
Horse	“Screw the horse”	134
Leveling	Player and enemy levels and leveling	269
Mechanics		179
Missions	Structure and the nature of missions	127
Monsters	Fighting and strategies	323
Movement	Character control mechanics	63
Potions		85
Signs	Magic mechanic called signs	64
Skills	Skills and skill tree	149
Swords		193
System	Game systems	167
Weapons		91
Story		5567
Books	Source material for the game series	195
Characters		771
Ciri	Geralt’s adopted daughter	117
Continuity	Continuity and continuation	52
Cutscenes		133
Finish	Finishing the storyline	299
Geralt	Player controlled protagonist	465
Lore		130
Main Quest		465
Playthrough	Multiple playthroughs	119
Plot		93
Roach	Geralt’s horse	70
Story		2150
Storyline		119
Storytelling		60
Triss	One of the main romance options	93
Writing		124
Yennefer	One of the main romance options	112

We have extracted a total of 65 words from our review analysis of The Witcher 3: Wild Hunt. From 5 categories, 18 words were for Story, 22 for Gameplay, 16 for Exploration, 2 for Choice, and 7 for Challenge.

The combined number of uses for words related to story total 5567, meaning they make 38.94% of the review words. The combined number of uses for words related to gameplay total 3560, meaning they make 24.90% of the review words. The combined number of uses for words related to exploration total 4008, meaning they make 28.03% of the review words. The combined number of uses for words related to choice total 433, meaning they make 3.03% of the review words. The combined number of uses for words related to challenge total 726, meaning they make 5.08% of the review words.

4.2 Case: The Elder Scrolls V: Skyrim

4.2.1 Description

The Elder Scrolls V: Skyrim is an open-world action role-playing game developed by Bethesda Game Studios. It was released on November 11, 2011, with a re-release on October 28, 2016, with the title The Elder Scrolls V: Skyrim Special Edition. Set in the fictional continent of Tamriel's northern province of Skyrim, the player controls the Dragonborn character, trying to defeat the dragon known as Alduin the World-Eater. The player can roam the lands of Skyrim, exploring dungeons, caves, cities, and villages, accepting missions from non-playable characters, joining factions spread around the province, earning experience points and usable items throughout their playtime. The Elder Scrolls V: Skyrim Special Edition sits at a 89.45% and a 'Very Positive' review score on Steam. The review and achievement information for the 2011 release version of the game is not available to us which is why we are using data gathered from the Special Edition.

4.2.2 Achievements

There are a total of 75 achievements in The Elder Scrolls V: Skyrim Special Edition. All 75 of these achievements have been a part of the game since the Special Edition's initial release. List of achievements with their Steam unlock percentages can be found in Table 4.3.

Table 4.3 : Achievements of The Elder Scrolls V: Skyrim Categorized

%	Name	Description	Category
66,80%	Unbound	Complete "Unbound"	Story
57,30%	Blessed	Select a Standing Stone blessing	Exploration
48,40%	Apprentice	Reach Level 5	Gameplay
45,70%	Dragon Soul	Absorb a dragon soul	Exploration
45,40%	Bleak Falls Barrow	Complete "Bleak Falls Barrow"	Story
39,30%	Adept	Reach Level 10	Gameplay
33,20%	The Way of the Voice	Complete "The Way of the Voice"	Story
29,10%	Words of Power	Learn all three words of a shout	Exploration
27,70%	Gatekeeper	Join the College of Winterhold	Exploration
27,50%	Citizen	Buy a house	Exploration
26,80%	Daedric Influence	Acquire a Daedric Artifact	Exploration
25,30%	Expert	Reach Level 25	Gameplay
25,20%	Take Up Arms	Join the Companions	Choice
22,70%	Artificer	Make a smithed item, an enchanted item, and a potion	Gameplay
20,50%	Outlander	Arrive on Solstheim	Story
20,20%	Taking Care of Business	Join the Thieves Guild	Choice
19,70%	Explorer	Discover 100 Locations	Exploration
19,70%	Skill Master	Get a skill to 100	Gameplay
19,70%	Snake Tongue	Successfully persuade, bribe, and intimidate	Gameplay
19,50%	Diplomatic Immunity	Complete "Diplomatic Immunity"	Story
18,80%	Hero of the People	Complete 50 Misc Objectives	Exploration
17,10%	Awakening	Complete "Awakening"	Story
16,20%	Blood Oath	Become a member of the Circle	Choice
16,10%	Taking Sides	Join the Stormcloaks or the Imperial Army	Exploration
16,00%	Alduin's Wall	Complete "Alduin's Wall"	Story
15,90%	Landowner	Buy a plot of land	Exploration
14,50%	With Friends Like These...	Join the Dark Brotherhood	Choice
14,40%	Revealing the Unseen	Complete "Revealing the Unseen"	Exploration
13,80%	The Eye of Magnus	Complete "The Eye of Magnus"	Exploration
13,80%	Golden Touch	Have 100,000 gold	Gameplay
13,70%	Proud Parent	Adopt a child	Exploration
13,50%	The Temple of Miraak	Complete "The Temple of Miraak"	Story
13,40%	Elder Knowledge	Complete "Elder Knowledge"	Story
12,50%	Delver	Clear 50 dungeons	Exploration
12,50%	Sideways	Complete 10 side quests	Exploration
12,40%	Dragon Hunter	Absorb 20 dragon souls	Exploration
12,00%	Beyond Death	Complete "Beyond Death"	Story
11,80%	Glory of the Dead	Complete "Glory of the Dead"	Choice
11,30%	The Fallen	Complete "The Fallen"	Story
11,20%	Hard Worker	Chop wood, mine ore, and cook food	Gameplay
10,90%	The Path of Knowledge	Complete "The Path of Knowledge"	Story
10,80%	Dragonslayer	Complete "Dragonslayer"	Story

Table 4.3 (continued) : Achievements of The Elder Scrolls V: Skyrim Categorized

%	Name	Description	Category
10,50%	Bound Until Death	Complete "Bound Until Death"	Choice
10,40%	Master	Reach Level 50	Gameplay
10,20%	Darkness Returns	Complete "Darkness Returns"	Choice
10,20%	Architect	Build three wings on a house	Gameplay
9,90%	Kindred Judgement	Complete "Kindred Judgment"	Story
9,70%	At the Summit of Apocrypha	Complete "At the Summit of Apocrypha"	Story
9,60%	Hail Sithis!	Complete "Hail Sithis!"	Choice
9,60%	Hero of Skyrim	Capture Solitude or Windhelm	Story
9,50%	War Hero	Capture Fort Sungard or Fort Greenwall	Exploration
8,60%	Married	Get married	Exploration
8,60%	Reader	Read 50 Skill Books	Exploration
8,40%	A New You	Change your face	Gameplay
8,20%	Thu'um Master	Learn 20 shouts	Gameplay
7,40%	Standing Stones	Find 13 Standing Stones	Exploration
7,10%	Wanted	Escape from jail	Choice
6,90%	Lost to the Ages	Complete "Lost to the Ages"	Exploration
6,80%	Raven Rock Owner	Own a house in Raven Rock	Exploration
6,80%	Soul Tear	Learn all three words of Soul Tear	Story
6,70%	Dragon Aspect	Learn all 3 words of Dragon Aspect	Exploration
6,60%	Thief	Pick 50 locks and 50 pockets	Gameplay
6,10%	Solstheim Explorer	Discover 30 locations on the island of Solstheim	Exploration
5,40%	Hidden Knowledge	Learn the secrets of 5 Black Books	Story
4,50%	One with the Shadows	Returned the Thieves Guild to its former glory	Choice
4,10%	Land Baron	Buy three plots of land	Exploration
4,00%	Auriel's Bow	Use the special power of Auriel's Bow	Gameplay
3,60%	Legend	Defeat a Legendary Dragon	Gameplay
3,00%	Stalhrim Crafter	Craft an item out of Stalhrim	Gameplay
2,80%	Werewolf Mastered	Acquire 11 werewolf perks	Exploration
2,60%	Oblivion Walker	Collect 15 Daedric Artifacts	Exploration
2,50%	Master Architect	Build three houses	Exploration
2,30%	Vampire Mastered	Acquire 11 vampire perks	Gameplay
2,00%	Dragonrider	Tame and ride 5 dragons	Exploration
2,00%	Master Criminal	Bounty of 1000 gold in all nine holds	Gameplay

Our categories for achievements in The Elder Scrolls V: Skyrim Special Edition include story, gameplay, exploration as well as choice, for player choices for which factions they want to side with and do their questlines.

The achievement with the highest percentage of unlocks is 'Unbound' at 66.8%. This achievement is a story achievement. The achievement with the lowest percentage of unlocks is 'Master Criminal' at 2%. This achievement is a gameplay achievement.

Average unlock rate of achievements for The Elder Scrolls V: Skyrim Special Edition is 15.45%. When divided into categories, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 18 story achievements, ranging from 66.8% completion and 5.4% completion with an average of 18.43%. There are a total number of 18 gameplay achievements, ranging from 48.4% completion and 2% completion with an average of 14.38%. There are a total number of 29 exploration achievements, ranging from 57.3% completion and 2% completion with an average of 15.12%. There are a total number of 10 choice achievements, ranging from 25.2% completion and 4.5% completion with an average of 12.98%.

The achievement players unlock for finishing the main storyline of the main game is ‘Dragonslayer’, this story achievement has an unlock rate of 10.8%, 7.63% lower than the average percentage for story achievements and 4.65% lower than the overall average of achievement completion. Looking at all these low percentages, we should remember we don’t have the data for the players of the original release of the game.

4.2.3 Reviews

We have compiled a list of user reviews for The Elder Scrolls V: Skyrim Special Edition from Steam between 27.10.2016 and 20.11.2021. There are a total of 53062 user reviews made between these dates. 50456 of these reviews are tagged positive for recommendation, giving us a percentage of 95.1% positive sentiment towards the game. Table 4.4 shows the list of nodes created and categorized manually.

Table 4.4 : Coded Words From The Elder Scrolls V: Skyrim Reviews

Codes	Extra Descriptors	References
Choice		1986
Choices		333
Dark Brotherhood	One of the factions player can join	86
Factions		116
Guilds	Thieve’s Guild, Companions, Dark Brotherhood, etc.	198
Imperial Legion	“Imperials”	271
Missions		251
Questlines	Faction quest lines	199
Stormcloacks		237
Vampire	Vampires and vampirism	295
Exploration		9995
Books	Collectible loot items	156
Dungeons		370
Exploring	Exploring and exploration	961
Faction sides	Sides of the faction war.	202
Homes		210

Table 4.4 (continued) : Coded Words From The Elder Scrolls V: Skyrim Reviews

Codes	Extra Descriptors	References
Exploration		9995
Horses		223
Houses		312
Lore		481
Map		293
NPCs		248
Quests		2776
Side quests		503
World	Game world	3213
World Building		47
Gameplay		9145
Armor		363
Arrows		94
Build	Building a character, or a home	427
Character	Our playable character, it's building and development.	1485
Combat		797
Enemies		343
Fights		520
Gameplay		1062
Leveling	Player and enemy levels, leveling up, and level scaling	703
Mage	Player class	233
Magic		520
Mechanics		271
Powers		316
Shouts	Shout mechanic earned through exploration	278
Skills	Upgrades players earn through playing and leveling up	473
Swords		259
Systems	Game systems	579
Weapons		422
Story		5848
Dragonborn	The title of player character	548
Dragons		1617
Finishing	Story completion	470
Playthrough		315
Story		2412
Storylines		350
Writing		136

We have extracted a total of 48 words from our review analysis of The Elder Scrolls V: Skyrim. From 4 categories, 7 words were for Story, 18 for Gameplay, 14 for Exploration, and 9 for Choice.

The combined number of uses for words related to story total 5848, meaning they make 21.68% of the review words. The combined number of uses for words related to gameplay total 9145, meaning they make 33.90% of the review words. The combined number of uses for words related to exploration total 9995, meaning they make 37.05% of the review words. The combined number of uses for words related to choice total 1986, meaning they make 7.36% of the review words.

One word not included in any category but has an impact on player engagement is ‘mods’ or ‘modding’. There were 12687 reviews where community created add-ons called mods (short for modifications) was mentioned making 31.99% our review words. Since this word doesn’t have any interaction with the game achievements, we have omitted this word from our dataset.

4.3 Case: Assassin’s Creed Origins

4.3.1 Description

Assassin’s Creed Origins is an open-world action role-playing game developed by Ubisoft Montreal and published on October 27, 2017. It is the 10th mainline installment in the Assassin’s Creed franchise. Set in Egypt in the Ptolemaic period, the player controls a Medjay, protector of the lands, Bayek of Siwa and his wife Aya as they deal with the death of their son and the millennia-long conflict between the two secret orders of Assassin’s Creed. The player can traverse the lands in free roam, opening up side activities and treasure locations by synchronizing points of interest. By completing missions and defeating enemies ranging from soldiers to Egyptian wildlife, the player can gain experience points and items to improve their playable character. Assassin’s Creed Origins sits at an 85.18% and a ‘Very Positive’ review score on Steam.

4.3.2 Achievements

There are a total of 67 achievements in Assassin’s Creed Origins. 51 of these achievements have been a part of the game since its initial release, while 6 have been released with ‘The Hidden Ones’, 6 with ‘The Curse of Pharaohs’, and 4 with ‘Egypt Tour’ expansions. List of achievements with their Steam unlock percentages can be found in Table 4.5

Table 4.5 : Achievements of Assassin’s Creed Origins Categorized

%	Achievement Name	Description	Category
72,2	First Steps	Complete the Prologue.	Story
70,4	Raider of the Lost Tomb	Complete a tomb.	Exploration
64,8	The Festival	Complete Side Quest "Lady of Slaughter".	Exploration
61,1	I'm Just Getting Started	Complete Main Quest "Aya".	Story
53,2	You still need 8880...	Reach level 20.	Gameplay

Table 4.5 (continued) : Achievements of Assassin’s Creed Origins Categorized

%	Achievement Name	Description	Category
52	The Scarab	Complete Main Quest "The Scarab's Lies".	Story
51,8	The Sea	Complete Main Quest "Pompeius Magnus".	Story
51,2	Rider's Licence	Use all types of vehicle at least once.	Gameplay
50	Handy Man	Craft 20 items.	Gameplay
49,1	Smash!	Destroy 100 breakable objects.	Gameplay
49	The Hyena	Complete Main Quest "The Hyena".	Story
47,6	Free as a Bird	Use the eagle for a total of 30 minutes.	Gameplay
47,6	Run For Your Life!	Run away from 3 fights with a hippo.	Gameplay
47,6	Triathlete	Swim for 1500m, ride for 40km and run for 10km.	Gameplay
47,3	Wake Up!	Complete Main Quest Dream Sequence.	Story
46,2	The Lizard	Complete Main Quest "The Lizard's Face".	Story
45,1	Shadow of Egypt	Kill 10 enemies in a row without being detected.	Gameplay
43,4	Defy Authority	Defeat a Phylakes.	Exploration
40,3	The Crocodile	Complete Main Quest "The Crocodile's Jaws".	Story
40,2	I'm Done Learning	Activate a Master ability.	Gameplay
38,4	Slasher	Kill 3 enemies with one hit.	Gameplay
35,9	The Siege	Complete Main Quest "The Aftermath".	Story
35,6	I'm a Legend	Be equipped with only Legendary equipment.	Gameplay
33,4	Almost There	Complete Main Quest "The Final Weighing".	Story
32,4	The End	Complete the last Main Quest.	Story
31,3	Elementary, My Dear Bayek	Solve a papyrus mystery.	Exploration
29,2	The Arrow Whisperer	Kill an enemy with the predator bow from more than 60 meters while controlling the arrow.	Gameplay
19,8	Fatality!	Finish an arena boss with an Overpower Attack.	Gameplay
19,6	Seven Farmers	Complete Side Quest "Seven Farmers".	Exploration
18,7	Ben-Hur	Win the first Hippodrome tournament.	Exploration
18,4	Stargazer	Complete all 12 Stone Circles.	Exploration
15,1	Prison Break	Free 20 Rebels (The Hidden Ones)	Exploration
15	I Know My Land	Defog the whole map.	Exploration
14,6	Rooooaarrrrr!	Tame a lion.	Gameplay
14,5	Archer of the Month	Headshot kill an enemy with the bow while in the air.	Gameplay
14,3	Road Rage	Destroy an opponent in a Hippodrome race.	Exploration
14	I Can See My House From Here!	Reach the "Top of the World" in the Black Desert territory.	Exploration
13,3	The Harder They Fall	Defeat the war elephants Qetesh & Resheph.	Exploration
13,2	Surgical Strikes	Complete the Walls-of-the-Ruler citadel	Story
13,1	The Greater Good	Complete Main DLC Quest "The Greater Good" (The Hidden Ones)	Story
13	Master Diver	Complete 15 underwater locations.	Exploration
12,6	Team Play	Kill an enemy with a headshot while they are being harassed by Senu (The Hidden Ones)	Gameplay
11,7	Project Comet	Craft an upgrade using Shards of a Star (The Curse of the Pharaohs)	Gameplay
11,3	New Recruits	Complete Side DLC Quests "Rise of Shaqilat" and "Shadows of the Scarab" (The Hidden Ones)	Exploration
11	Walls of the Ruler	Complete the Walls-of-the-Ruler citadel (The Hidden Ones)	Exploration

Table 4.5 (continued) : Achievements of Assassin's Creed Origins Categorized

%	Achievement Name	Description	Category
10,8	Circle of Life	Feed a predator with a corpse.	Gameplay
10,8	Overheating	Witness raining bugs in the desert.	Exploration
10,6	Higher Power	Reach level 55 (The Curse of the Pharaohs)	Gameplay
10,3	Where's My Black Flag?	Defeat 8 Ship Captains.	Gameplay
9,9	First Visit	Complete one tour	Tour
9,8	Reporter	Take 1 photo in 5 different territories.	Exploration
9,7	Namaste	Use Dawn & Dusk to make time speed forward 30 times.	Gameplay
9,6	For Those About to Die...	Complete all arena events in the Krokodilopolis Arena.	Exploration
9,5	Lift the Curse	Defeat Tutankhamun in the Afterlife (The Curse of the Pharaohs)	Exploration
9,2	Words of Wisdom	Complete all hermit locations.	Exploration
7,5	Reduce, Reuse, Recycle	Sell 100 trinkets at once.	Gameplay
6,3	Pyromaniac	Kill a Mummy by setting it on fire (The Curse of the Pharaohs)	Gameplay
5,8	Set-up Date	Bring a tamed lion to a crocodile.	Gameplay
5,1	Sting in the Tale	Complete the 5 Serqet locations (The Curse of the Pharaohs)	Exploration
5,1	Old Habits	Complete all locations.	Exploration
4,8	Overdesign	Kill a poisoned level 35+ enemy with the torch in less than 30 seconds.	Gameplay
3,9	Dark Horse	Acquire Eternal Maw for use outside the Afterlives (The Curse of the Pharaohs)	Story
3	What Time is It?	Perform a leap of faith from Arsinoe's sundial obelisk between 10 am and noon (The Hidden Ones)	Tour
2,8	Zip it Off	Perform 3 Assassinations from a zipline (The Hidden Ones)	Gameplay
2,7	Polymorph	Complete tours with at least 5 different characters	Tour
2,6	BOOM!	Kill 30 enemies by shooting a fire arrow at oil jars.	Gameplay
2,3	Archeologist	Complete all tours in the Daily Life category	Tour

Our categories for achievements in Assassin's Creed Origins include story, gameplay, exploration as well as tour, for achievements unlocked from The Discovery Tour, the virtual museum mode of Assassin's Creed Origins, which is not a part of the game experience.

The achievement with the highest percentage of unlocks is 'First Steps' at 72.2%. This achievement is a story achievement. The achievement with the lowest percentage of unlocks is 'Archeologist' at 2.3%. This achievement is a tour achievement. Average unlock rate of achievements for Assassin's Creed Origins is 25.1%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 14 story achievements, ranging from 72.2% completion and 3.9% completion with an average of 39.4%. If expansion achievements are removed from this list, the average increases to 44.6%. There are a total number of 27 gameplay achievements, ranging from 53.2% completion and 2.6% completion with an average of 25.15%. There are a total number of 22 exploration achievements, ranging from 70.4% completion and 5.1% completion with an average of 19.66%. There are a total number of 4 tour achievements, ranging from 9.9% completion and 2.3% completion with an average of 4.48%.

The achievement players unlock for finishing the main storyline of the main game is 'The End', this story achievement has an unlock rate of 32.4%, 7% lower than the average percentage for story achievements but 7.3% higher than the overall average of achievement completion.

4.3.3 Reviews

We have compiled a list of user reviews for Assassin's Creed Origins from Steam between 11.11.2018 and 12.09.2021. There are a total of 11260 user reviews made between these dates. 9829 of these reviews are tagged positive for recommendation, giving us a percentage of 87.29% positive sentiment towards the game. Table 4.6 shows the list of nodes created and categorized manually.

Table 4.6 : Coded Words From Assassin's Creed Origins Reviews

Codes	Descriptors	References
Exploration		9634
Areas		297
Cities		242
Deserts		244
Egypt		1321
Egyptian		399
Environments		221
Exploring		898
Landscape		119
Locations		285
Map		675
Pyramids		230
Quests		1593
Scenery		129
Side		1181
Sidequest		101

Table 4.6 (continued) : Coded Words From Assassin's Creed Origins Reviews

Codes	Descriptors	References
Exploration		9634
World		1699

Table 4.5 (continued) : Coded Words From Assassin's Creed Origins Reviews

Codes	Extra Descriptors	References
Gameplay		10649
Attack		231
Boss	Boss fights	180
Bow		166
Climbing		232
Combat		1454
Crafting		111
Eagle		112
Enemies		577
Fighting		514
Gameplay		1154
Leveling		1119
Loot		189
Mechanics		532
Missions		695
Parkour		174
RPG		829
Skills		314
Stealth		449
Systems		814
Upgrade		282
Weapons		521
Story		7852
Animus		126
Aya		201
Bayek		757
Brotherhood		155
Characters		1087
Cleopatra		83
Main	Main Story/Quest	1171
Plot		203
Protagonist		171
Story		3557
Storyline		211
Writing		130
Tour		247
Discovery		119
Tour		128

We have extracted a total of 51 words from our review analysis of Assassin's Creed Origins. From 4 categories, 12 words were for Story, 21 for Gameplay, 16 for Exploration, and 2 for Tour.

The combined number of uses for words related to story total 7852, meaning they make 27.67% of the review words. The combined number of uses for words related to gameplay total 10649, meaning they make 37.52% of the review words. The combined number of uses for words related to exploration total 9634, meaning they make 33.94% of the review words. The combined number of uses for words related to tour total 247, meaning they make 0.87% of the review words.

4.4 Case: Assassin's Creed Odyssey

4.4.1 Description

Assassin's Creed Odyssey is an open-world action role-playing game developed by Ubisoft Quebec and published on October 5, 2018. It is the 11th mainline installment in the Assassin's Creed franchise. Odyssey tells a mythological version of the Peloponnesian War between Athens and Sparta from 431 to 422 BC. The player will select from two options for their main character between the characters Alexios and Kassandra and plays as a mercenary. The player can traverse the lands and seas in free roam, opening up side activities and treasure locations by synchronizing points of interest. By completing missions and defeating enemies, the player can gain experience points and items to improve their playable character. The player can also make story and dialogue choices for their character which changes the storyline and results of events. Assassin's Creed Odyssey sits at an 87.91% and a 'Very Positive' review score on Steam.

4.4.2 Achievements

There are a total of 93 achievements in Assassin's Creed Odyssey. 50 of these achievements have been a part of the game since its initial release, while 11 have been released with The Lost Tales of Greece, 15 with The Legacy of the First Blade, 15 with The Fate of Atlantis, and 2 with Mythical Creatures expansions. List of achievements with their Steam unlock percentages can be found in Table 4.7.

Table 4.7 : Achievements of Assassin's Creed Odyssey Categorized

%	Achievement Name	Description	Category
91,30%	This is Sparta!	Complete the Battle of 300.	Story
77,10%	Shiny!	Acquire and equip your first Legendary item.	Gameplay
75,50%	An Odyssey in the Making	Complete Episode 1.	Story
70,60%	Past Mistakes	Complete Episode 2.	Story
69,70%	Harder, Better, Faster, Stronger	Upgrade the Adrestia for the first time.	Gameplay
68,40%	Ramming Speed	Cleave a ship in half.	Gameplay
66,90%	Make It Your Own	Engrave your first item.	Gameplay
65,40%	Evil Unearthed	Complete Episode 3.	Story
64,00%	Aphrodite's Embrace	Spend the night with another character.	Exploration
61,00%	I am Legend	Equip 1 Legendary melee weapon and 5 Legendary armor pieces.	Gameplay
60,30%	You Work for Me Now	Recruit and assign a Legendary NPC for your ship.	Gameplay
59,70%	Scourge of the Aegean	Sink your first Epic Ship.	Gameplay

Table 4.7 (continued) : Achievements of Assassin's Creed Odyssey Categorized

%	Achievement Name	Description	Category
57,70%	Hero for Hire	Win your first on land conquest battle in any region (excluding Megaris in Hero's Journey).	Gameplay
57,10%	Fashion's Creed	Equip a Legendary Armor set.	Gameplay
56,20%	The Bright Minds	Complete Episode 4.	Story
54,60%	War Master	Kill the Leader of any Region with Low Resources, other than Megaris.	Exploration
47,50%	From the Ashes	Complete Episode 5.	Story
47,00%	Democracy Falls	Complete Episode 6.	Story
45,00%	Infamous	Raise your Bounty to the maximum level.	Gameplay
43,80%	The Midas Touch	Engrave a Legendary Item with a Legendary Effect.	Gameplay
42,60%	One Head Down...	Defeat a full cluster of Cultists of Kosmos.	Exploration
41,30%	Godly Power	Acquire a Tier 3 active Ability.	Gameplay
41,00%	Birthright	Discover Atlantis and speak with Pythagoras.	Exploration
39,10%	Going For Gold	Complete the Olympic questline.	Exploration
38,40%	The Argonauts	Fully crew the Adrestia with Legendary Lieutenants.	Gameplay
37,20%	Legend in the Making	Complete Episode 7.	Story
37,10%	Blood Sport	Defeat a Mercenary in the Arena.	Exploration
36,80%	Riddle Me This	Outwit the Sphinx.	Exploration
36,10%	Taking Back Athens	Complete Episode 8.	Story
35,80%	A-maze-ing Victory!	Defeat the Minotaur.	Gameplay
35,80%	Odyssey's End	Complete Episode 9 + Epilogue.	Story
35,50%	Demigod	Reach Level 50.	Gameplay
33,90%	Eye on the Prize	Defeat the Cyclops.	Gameplay
33,30%	Are You Not Entertained?	Become Champion of the Arena.	Exploration
32,70%	Lightning Rod	Defeat Steropes the Lightning Bringer.	Gameplay
32,30%	Top of the Food Chain	Become the first Mercenary.	Exploration
31,60%	Wrath of the Amazons	Cleave a ship while having an all-women crew.	Exploration
30,90%	In Perseus's Image	Defeat Medusa.	Gameplay
26,90%	The Cult Unmasked	Defeat all the Cultists of Kosmos.	Exploration
26,80%	Legacy Restored	Upgrade your Spear to Tier 6.	Gameplay
26,20%	Master of the Hunt	Complete the Daughters of Artemis questline.	Exploration
24,80%	Without a trace	Kill 10 enemies using the Death Veil ability	Gameplay
23,30%	Volcanic Sunscreen	Defeat Arges, the Bright One	Gameplay
22,30%	Lord of the Seas	Upgrade the Adrestia to Legendary Status.	Gameplay
21,10%	Misthios in Training	Complete 20 Bounties, War Contracts, or Naval Quests from Message Boards.	Exploration
19,80%	The Heir of Memories	Complete The Heir of Memories	Exploration
19,30%	I Have the Power	Perform an Overpower Attack with every weapon type.	Gameplay
18,20%	The Daughters of Lalaia	Complete The Daughters of Lalaia	Exploration
17,80%	Divine Intervention	Complete Divine Intervention.	Exploration
16,60%	The Start of a Legacy	Discover the truth about Darius' past	Story
16,50%	A Brother's Seduction	Complete A Brother's Seduction	Exploration
16,40%	A Friend Worth Dying For	Complete A Friend Worth Dying For	Exploration
15,00%	Seeing Red	Kill 10 enemies using the Fury of the Bloodline Ability.	Gameplay

Table 4.7 (continued) : Achievements of Assassin's Creed Odyssey Categorized

%	Achievement Name	Description	Category
14,80%	Island Hopper	Complete 20 Quests on Pephka, Obsidian and Abantis islands.	Exploration
14,60%	Predator and Prey	Kill all the Ancients in the Order of the Hunters in Makedonia	Exploration
14,60%	Everybody Benefits	Complete Markos's questline.	Exploration
14,00%	The Show Must Go On	Complete The Show Must Go On.	Exploration
13,70%	The Image of Faith	Complete The Image of Faith	Exploration
13,70%	Blood of Leonidas	Continue the bloodline.	Story
13,50%	Every Story Has an Ending	Complete Every Story Has an Ending	Exploration
12,70%	Fire on Water	Set 10 enemy ships on fire.	Gameplay
12,40%	Gathering Strength	Collect all the Keeper's Insights in Episode 1.	Exploration
12,30%	No More Rulers	Kill all Overseers in Elysium.	Exploration
12,30%	Stormculler	Kill all of the Ancients in the Order of the Storm in Achaia.	Exploration
12,30%	Bittersweet Beginnings	Secure your bloodline	Story
12,20%	In the Face of the Gods	Remember who you are.	Story
12,00%	One Really, Really Bad Day	Complete One Really, Really Bad Day	Exploration
12,00%	Trust Me, I'm a Doctor	Complete the Hippokrates questline.	Exploration
11,70%	A Poet's Legacy	Complete A Poet's Legacy.	Exploration
11,30%	Bad Dog!	Defeat Cerberos.	Gameplay
11,10%	For Love of Persia	Kill all the Ancients in the Order of Dominion in Messenia	Exploration
11,00%	Kingmaker	Acquire the Sword of Kings	Exploration
10,80%	Stink Eye	Recover the Cyclops's eye from a goat on Kephallonia.	Exploration
10,40%	Gathering More Strength	Collect all the Keeper's Insights in Episode 2.	Exploration
10,30%	A True Ruler	Dethrone the king.	Story
9,30%	Old Flames Burn Brighter	Complete Old Flames Burn Brighter	Exploration
8,90%	Gathering Full Strength	Collect all the Keeper's Insights in Episode 3.	Exploration
8,80%	The One	Defeat all of the Fallen.	Exploration
8,70%	Isu Bloodline	Completely fill the Knowledge Sequence.	Story
8,60%	The Conqueror	Win the conquest of Elysium with freed humans from the 3 main regions.	Exploration
8,40%	1 Versus 100	Defeat the Hekatonchires.	Story
7,60%	A Pirate's Life for Me	Complete Xenia's questline.	Exploration
7,10%	Hephaistos's Apprentice	Forge the 3 Legendary Weapons.	Exploration
6,30%	Blasphemer	Destroy all of the Marble Maiden Tributes.	Exploration
5,90%	Breaking the Limit	Land a Rush Assassinate that chains 4 times with the Blade of the Lion	Gameplay
5,10%	Guardian of the Underworld	Close all Tartaros Rifts.	Exploration
5,10%	Lone Lion	Kill the Makedonian Lion	Exploration
3,90%	Hermes's Homie	Unveil all sub-regions of Greece.	Exploration
3,80%	Rain of Arrows	Kill 10 enemies using the Rapid Fire ability.	Gameplay
3,70%	Child of Poseidon	Complete all underwater location objectives.	Exploration
3,30%	Parry to Carry	Heal by parrying 10 times with the Judgment of the Lion.	Gameplay
2,40%	Surgical Sniper	Heal by getting 10 headshot kills while you have the Golden Harbinger equipped.	Gameplay
2,20%	Your Own Medicine	Kill 10 Isu Soldiers with the Blessing of Kronos enhancement.	Gameplay

Our categories for achievements in Assassin's Creed Odyssey include story, gameplay, exploration. Optional categories of challenge, choice, and side-quest have been discussed during the categorization of achievements phase, but it was decided against as our main categories would be encompassing enough for these optional categories.

The achievement with the highest percentage of unlocks is 'This is Sparta!' at 91.3%. This achievement is a story achievement. The achievement with the lowest percentage of unlocks is 'Your Own Medicine' at 2.2%. This achievement is a gameplay achievement. Average unlock rate of achievements for Assassin's Creed Odyssey is 27.78%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 17 story achievements, ranging from 91.3% completion and 8.4% completion with an average of 37.93%. There are a total number of 31 gameplay achievements, ranging from 77.1% completion and 2.2% completion with an average of 35.11%. There are a total number of 45 exploration achievements, ranging from 64% completion and 3.7% completion with an average of 18.91%.

The achievement players unlock for finishing the main storyline of the main game is 'Odyssey's End', this story achievement has an unlock rate of 35.8%, 2.13% lower than the average percentage for story achievements but 8.02% higher than the overall average of achievement completion.

4.4.3 Reviews

We have compiled a list of user reviews for Assassin's Creed Odyssey from Steam between 05.10.2018 and 12.09.2021. There are a total of 34132 user reviews made between these dates. 30801 of these reviews are tagged positive for recommendation, giving us a percentage of 90.24% positive sentiment towards the game. Table 4.8 shows the list of nodes created and categorized manually.

Table 4.8 : Coded Words From Assassin's Creed Odyssey Reviews

Codes	Description	References
Exploration		26206
Bosses		425
Bounty	Bounties, bounty missions, bounty hunters	628
Cities		508
Environments		442
Exploring		2763

Table 4.8 (continued) : Coded Words From Assassin's Creed Odyssey Reviews

Codes	Description	References
Exploration		26206
Fighting	Events not mechanics	2004
Greece		599
Greek		2046
Locations		745
Map	The size	1947
Missions		1654
Quests		6126
World		6319
Gameplay		35451
Abilities		1256
Armor		717
Battles		1241
Climbing		538
Combat		4734
Enemies		2138
Gameplay		3184
Grind		2029
Items		596
Kicking	Spartan Kick Ability	701
Legendary	Gear and Enemies	509
Leveling		4638
Looting		686
Mechanics		1571
Mercenaries	The Mercenary System	1122
Naval	Naval battles, combat, and mechanics	633
Ship		1756
Skills	Tree, Points	1166
Stealth		1141
Systems		2684
Upgrading	Items and ship	1196
Weapons		1215
Story		24256
Alexios		759
Characters		3940
Choices		1696
Dialogue		843
Kassandra		1339
Plot		486
Protagonist	Alexios or Kassandra	378
Sparta	Sparta and Spartan	1529
Story		10845
Storyline		932
Voice Acting	The word "voice"	945
Writing		564

We have extracted a total of 47 words from our review analysis of Assassin's Creed Odyssey. From 3 categories, 12 words were for Story, 22 for Gameplay, and 13 for Exploration.

The combined number of uses for words related to story total 24256, meaning they make 32.82% of the review words. The combined number of uses for words related to gameplay total 35451, meaning they make 47.96% of the review words. The combined number of uses for words related to exploration total 26206, meaning they make 35.46% of the review words.

4.5 Case: Mass Effect 3

4.5.1 Description

Mass Effect 3 is an action role-playing game developed by BioWare and published by Electronic Arts on March 6, 2012. The game was first released on Origin, Electronic Arts' own digital game distribution platform. The game was added to Steam on June 11, 2020. Mass Effect 3 is the third installment in the Mass Effect series and it's the finale of the 'Mass Effect Trilogy'. The player controls Commander Shepard, a veteran soldier of the Systems Alliance Navy and the first human inductee to the Citadel Council Spectre (Special Tactics and Reconnaissance), group of agents that form the Citadel's task force. In Mass Effect 3, Commander Shepard is tasked with saving the galactic civilization from an invading force of sentient synthetic-organic starship race known as Reapers. Shepard must complete missions and gather resources to bring the races of the Milky Way together to increase their military strength for the coming battle against the Reapers. Through dialogue options, the player can decide the outcome of missions and the fate of the galaxy. After the game's release, Mass Effect 3's ending was a controversial topic among fans which forced BioWare to release the free expansion 'Extended Cut' which expanded upon the original ending. Mass Effect 3 sits at a 73.46% and a 'Mostly Positive' review score on Steam.

4.5.2 Achievements

There are a total of 68 achievements in Mass Effect 3. 50 of these achievements have been a part of the game since its initial release, while 2 have been released with From Ashes, 4 with Leviathan, 3 with Omega, and 9 with Citadel expansions. List of achievements with their Steam unlock percentages can be found in Table 4.9.

Table 4.9 : Achievements of Mass Effect 3 Categorized

%	Name	Description	Category
55,40%	Driven	Return to active duty.	Story

Table 4.9 (continued) : Achievements of Mass Effect 3 Categorized

%	Name	Description	Category
48,10%	Bringer of War	Chase down an assassin.	Story
48,10%	A Personal Touch	Modify a weapon.	Gameplay
44,80%	Shopaholic	Visit a store in the single-player campaign.	Exploration
43,90%	Recruit	Kill 250 enemies.	Gameplay
43,70%	Enlisted	Start a character in multiplayer or customize a character in single-player.	Gameplay
42,60%	Focused	Evolve any of your powers to rank 6.	Gameplay
42,20%	Mobilizer	Bring a veteran officer aboard.	Story
41,10%	Tourist	Complete one multiplayer match or two N7 missions.	Gameplay
40,70%	Eye of the Hurricane	Kill a brute while it's charging you.	Gameplay
38,80%	World Shaker	Destroy an Atlas dropped from orbit.	Gameplay
37,10%	Giant Killer	Defeat a harvester.	Story
36,80%	Prothean Expert	Learn more about the Prothean Empire.	Story
36,70%	Untouchable	Escape a Reaper in the galaxy map.	Gameplay
36,40%	Liberator	Stop a Cerberus kidnapping.	Story
35,90%	Pathfinder	Explore a lost city.	Story
35,80%	Tunnel Rat	Survive the swarm.	Story
35,20%	Arbiter	Win a political stand-off.	Story
33,70%	Soldier	Kill 1,000 enemies.	Gameplay
33,50%	Explorer	Complete three multiplayer matches or five N7 missions.	Gameplay
32,90%	Pyromaniac	Set 100 enemies on fire with powers.	Gameplay
32,90%	Party Crasher	Sabotage a dreadnought.	Story
32,10%	Problem Solver	Evacuate a scientific facility.	Story
32,10%	Almost There	Reach level 15 in multiplayer or level 50 in single-player.	Gameplay
31,90%	Fact Finder	Discover an enemy's monstrous origin.	Story
31,50%	Hard Target	Call down an orbital strike.	Story
30,20%	Saboteur	Disable a group of fighter squadrons.	Gameplay
30,10%	Last Witness	Extract ancient technology.	Story
29,90%	Lost and Found	Dispatch 10 probes to retrieve people or resources in Reaper territory.	Exploration
29,50%	Paramour	Establish or rekindle a romantic relationship.	Choice
29,40%	Well Connected	Send a warning across the galaxy.	Story
28,80%	Tour of Duty	Finish all multiplayer maps or all N7 missions in single-player.	Gameplay
28,10%	Executioner	Defeat an old adversary.	Story
27,20%	Patriot	Make the final assault.	Story
25,60%	Legend	Mission accomplished.	Story
24,20%	Always Prepared	Obtain two non-customizable suits of armor.	Gameplay
23,20%	Mail Slot	Kill 10 guardians with headshots from the front while their shields are raised.	Gameplay
23,00%	Freedom Fighter	Find all required intel to help Eden Prime's colonists.	Exploration
22,70%	Master and Commander	Deliver most of the Galaxy at War assets to the final conflict.	Choice
22,50%	Combined Arms	Perform any combination of 50 biotic combos or tech bursts.	Gameplay

Table 4.9 (continued) : Achievements of Mass Effect 3 Categorized

%	Name	Description	Category
21,30%	Long Service Medal	Complete Mass Effect 3 twice, or once with a Mass Effect 2 import.	Exploration
20,90%	Sky High	Lift 100 enemies off the ground with powers.	Gameplay
18,40%	Peak Condition	Reach level 20 in multiplayer or level 60 in single-player.	Gameplay
17,10%	Talon	Find the Talon leader.	Story
17,00%	No Stone Unturned	Investigate a sinister conspiracy.	Story
16,90%	Savior	Free Omega from Cerberus Occupation.	Story
16,50%	Family Matters	Rescue a civilian from Reaper forces.	Story
16,30%	Priority Target	Discover a plot against you.	Story
16,20%	Under Pressure	Uncover an ancient secret.	Story
16,10%	High Society	Go undercover to follow a lead.	Story
16,00%	Team Player	Infiltrate an enemy stronghold with your crew.	Story
15,90%	Last Resort	Stop an out-of-control scheme before it's too late.	Story
15,20%	Conspiracy Theorist	Use clues to pinpoint the exact location of an objective.	Exploration
14,90%	Perfect Host	Throw a party for your friends.	Exploration
14,80%	Bruiser	Kill 100 enemies with melee attacks.	Gameplay
14,10%	Hijacker	Hijack an Atlas mech.	Gameplay
10,70%	Battle Scarred	Promote a multiplayer character to the Galaxy at War or import an ME3 character.	Gameplay
10,30%	King of the Castle	Win a prize at one of the arcade games.	Exploration
10,20%	Gunsmith	Upgrade any weapon to level 10.	Gameplay
9,70%	Defender	Attain the highest level of readiness in each theater of war.	Choice
8,90%	Overload Specialist	Overload the shields of 100 enemies.	Gameplay
7,90%	Veteran	Kill 5,000 enemies.	Gameplay
7,20%	Meticulous	Complete all the Command Center side-missions on Omega.	Exploration
6,20%	Simulated Hero	Score 9999 points in the combat simulator on Normal, Hardcore, or Insanity.	Gameplay
5,50%	Unwavering	Finish all multiplayer maps on Gold or all single-player missions on Insanity.	Gameplay
5,30%	Technical Issues	Investigate a strange occurrence in the combat simulator.	Exploration
4,80%	Insanity	Finish the game on Insanity without changing difficulty after leaving Earth.	Gameplay
4,40%	The One and Only	Defeat a group of Spectre-level opponents on Normal, Hardcore, or Insanity.	Gameplay

Our categories for achievements in Assassin's Creed Odyssey include story, gameplay, exploration, as well as choice for achievements that require specific story and dialogue choices for the player to select.

The achievement with the highest percentage of unlocks is 'Driven' at 55.4%. This achievement is a story achievement. The achievement with the lowest percentage of unlocks is 'The One and Only' at 4.4%. This achievement is a gameplay achievement.

Average unlock rate of achievements for Mass Effect 3 is 25.54%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 28 story achievements, ranging from 55.4% completion and 5.3% completion with an average of 28.04%. There are a total number of 29 gameplay achievements, ranging from 48.1% completion and 4.4% completion with an average of 24.95%. There are a total number of 8 exploration achievements, ranging from 44.8% completion and 7.2% completion with an average of 20.83%. There are a total number of 3 choice achievements, ranging from 29.5% completion and 9.7% completion with an average of 20.63%.

The achievement players unlock for finishing the main storyline of the main game is 'Legend', this story achievement has an unlock rate of 25.6%, almost exactly the same percentage as the average achievement unlock rate. However 'Legend' is 2.36% lower than the average story achievement unlock percentage.

4.5.3 Reviews

We have compiled a list of user reviews for Mass Effect 3 N7 Digital Deluxe Edition from Steam between 11.06.2020 and 07.09.2021. There are a total of 870 user reviews made between these dates. 637 of these reviews are tagged positive for recommendation, giving us a percentage of 73.2% positive sentiment towards the game. Table 4.10 shows the list of nodes created and categorized manually.

Table 4.10 : Coded Words From Mass Effect 3 Reviews

Codes	Description	References
Exploration		173
Citadel		42
Galaxy		32
Places		29
Quests		25
Universe		21
World		24
Gameplay		556
Combat		65
Cover		34
Enemies		32
Gameplay		67
Levelling		25
Missions	Structure of missions	72
Multiplayer		110
Powers		30
Replayability		22
RPG		41

Table 4.10 (continued) : Coded Words From Mass Effect 3 Reviews

Codes	Description	References
Exploration		173
Squadmates		20
Weapons		38
Story		826
Characters		157
Choices		92
Conclusion		25
Decision		30
Dialogue		32
Lore		23
Moments		37
Plot		22
Reapers		39
Shepard		68
Story		246
War		34
Writing		21

We have extracted a total of 31 words from our review analysis of Mass Effect 3. From 3 categories, 13 words were for Story, 12 for Gameplay, and 6 for Exploration.

The combined number of uses for words related to story total 826, meaning they make 53.12% of the review words. The combined number of uses for words related to gameplay total 556, meaning they make 35.75% of the review words. The combined number of uses for words related to exploration total 173, meaning they make 11.12% of the review words. The combined number of uses for words related to tour total 247, meaning they make 0.87% of the review words.

4.6 Case: Mass Effect Andromeda

4.6.1 Description

Mass Effect Andromeda is an open-world action role-playing game developed by BioWare which was published by Electronic Arts on March 21, 2017. In Mass Effect Andromeda, the player controls Scott or Sara Ryder, a young pioneer who is suddenly thrown into a position of leadership and quickly has to learn the ropes of what it means to be a Pathfinder. Mass Effect: Andromeda utilizes open world elements and a squad-based combat model combined with a main story which gives players agency through dialogue options. Mass Effect 3 sits at a 75.73% and a 'Mostly Positive' review score on Steam.

4.6.2 Achievements

There are a total of 55 achievements in Mass Effect: Andromeda. 55 of these achievements have been a part of the game since its initial release. List of achievements with their Steam unlock percentages can be found in Table 4.11.

Table 4.11 : Achievements of Mass Effect Andromeda Categorized

%	Name	Description	Category
79,30%	First Contact	Land on an alien planet.	Story
68,10%	Pathfinder	Become the new Pathfinder.	Story
59,80%	Initiated	Gain access to the Tempest.	Story
51,30%	World-Shaper	Activate the first Remnant vault.	Story
50,40%	Foothold	Establish an outpost.	Story
45,70%	Data Mining	Scan 100 different objects.	Gameplay
44,90%	First Steps	Meet the angara on Aya.	Story
44,70%	Full Roster	In single-player mode, recruit all six squadmates.	Story
33,80%	Exaltation	Destroy the exaltation facility or save the angaran prisoners.	Story
32,10%	Terraformer	Increase a discovered planet to 100% viability.	Gameplay
30,00%	Almost There	Reach Level 25 in single player mode or Level 15 in multiplayer mode.	Gameplay
26,50%	Craftsmanship	Craft armor or a gun with 3 augments.	Gameplay
25,70%	Pinpoint Shot	Hit 250 enemy weak points while using a scope. (Single-Player)	Gameplay
23,20%	Kitted Out	Kill a foe with a Rank 5 weapon in a single-player game or equip a Rank 10 weapon in multiplayer.	Gameplay
22,40%	Explorer	Complete a combined five strike team missions or APEX extractions in multiplayer mode.	Gameplay
21,60%	Jack Of All Trades	Equip three different profile types.	Gameplay
21,30%	Liberation	Free the salarian ark.	Story
21,10%	Role Model	Rescue the asari ark.	Exploration
21,10%	Peak Condition	Reach Level 40 in single-player mode or Level 20 in multiplayer mode.	Gameplay
19,70%	Helping Hand	Help Vetra's sister.	Exploration
19,00%	Alliance	Ally with an outlaw faction.	Exploration
18,70%	Activation	Activate the Remnant city.	Story
17,60%	Family Connections	Reboot the Pathfinder.	Story
17,40%	Mission Accomplished	Activate Meridian.	Story
16,80%	With Our Powers Combined	Detonate 10 targets that were primed by a teammate. (Single-Player)	Gameplay

Table 4.11 (continued) : Achievements of Mass Effect Andromeda Categorized

%	Name	Description	Category
16,70%	Buccaneer	Recover the krogan colony ship.	Exploration
16,10%	Building Bridges	Stop the Roekaar leader.	Exploration
15,40%	All Clear	Increase all discovered planets to 100% viability.	Exploration
15,00%	Fireworks	Perform 100 power combos.	Gameplay
14,70%	Signal Tracking	Find the source of the strange signal Peebee discovers.	Exploration
14,20%	United	Unite the outposts against a common threat.	Exploration
13,60%	Terminator	Kill 2000 enemies.	Gameplay
11,90%	Full Power	Evolve one tech, one combat, and one biotic power to Rank 6. (Single-Player)	Gameplay
10,30%	Close Combat Specialist	Kill 100 enemies with melee attacks.	Gameplay
9,90%	Mastermind	Using constructs, kill 100 enemies.	Gameplay
8,80%	Veteran	Successfully complete a combined 25 strike team missions or APEX multiplayer mode extractions.	Gameplay
7,70%	Trapshooter	Hit 25 floating enemies with Concussive Shot, Lance, or Incinerate. (Single-Player)	Gameplay
7,10%	Long-Distance Jump	Travel at least 30m in a single jump. (Single-Player)	Gameplay
7,00%	Death from Above	Kill 100 enemies while hovering. (Single-Player)	Gameplay
6,10%	Medic!	Perform 25 revivals on teammates.	Gameplay
5,70%	APEX	Complete the multiplayer mode tutorial mission.	Gameplay
4,10%	Icebreaker	Shatter a frozen enemy with a jump melee attack. (Single-Player)	Gameplay
3,90%	Pyrotechnics Expert	Light three enemies on fire with one continuous Flamethrower attack. (Single-Player)	Gameplay
3,20%	Matchmaker	Complete romances with three different characters across all playthroughs.	Exploration
2,80%	High Performance	Unlock Rank 6 for each single-player profile type, or obtain a Level 6 multiplayer bonus stat.	Gameplay
2,50%	Unwavering	Complete an "Insanity" single-player game, or 5 "Gold" multiplayer extractions from any firebase.	Gameplay
2,50%	Teamwork	Create six strike teams or earn 25 assist medals in multiplayer mode.	Gameplay
2,50%	Top Talent	Promote a strike team to Level 20.	Gameplay
2,40%	Vanguard Surprise	While cloaked, hit an enemy with a Charge attack. (Single-Player)	Gameplay
2,20%	Fastball	Hit an enemy with a thrown enemy 25 times. (Single-Player)	Gameplay
2,10%	Friendly Fire	Direct your Remnant VI to attack each type of Remnant enemy. (Single-Player)	Gameplay
1,90%	Hang Time	Keep the Nomad airborne for 35 seconds.	Gameplay

Table 4.11 (continued) : Achievements of Mass Effect Andromeda Categorized			
%	Name	Description	Category
1,80%	Sucker Punch	Use a melee attack to hit 25 floating enemies. (Single-Player)	Gameplay
1,60%	Rough Landing	Detonate a trip mine with a thrown enemy. (Single-Player)	Gameplay
1,60%	Cryptographer	Complete 20 Remnant puzzles in a single playthrough.	Gameplay

Our categories for achievements in Mass Effect: Andromeda include story, gameplay, and exploration.

The achievement with the highest percentage of unlocks is ‘First Contact’ at 79.3%. This achievement is a story achievement. The achievements with the lowest percentage of unlocks are ‘Rough Landing’ and ‘Cryptographer’, both at 1.6%. These achievements are both gameplay achievements. Average unlock rate of achievements for Mass Effect Andromeda is 19.05%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 12 story achievements, ranging from 79.3% completion and 17.4% completion with an average of 42.28%. There are a total number of 34 gameplay achievements, ranging from 45.7% completion and 1.6% completion with an average of 11.77%. There are a total number of 9 exploration achievements, ranging from 21.1% completion and 3.2% completion with an average of 15.57%.

The achievement players unlock for finishing the main storyline of the main game is ‘Mission Accomplished’, this story achievement has an unlock rate of 17.4%, 1.65% lower than the average achievement unlock rate and 24.88% lower than the average story achievement unlock percentage.

4.6.3 Reviews

We have compiled a list of user reviews for Mass Effect Andromeda from Steam between 11.06.2020 and 12.09.2021. There are a total of 3410 user reviews made between these dates. 2646 of these reviews are tagged positive for recommendation, giving us a percentage of 77.59% positive sentiment towards the game. Table 4.12 shows the list of nodes created and categorized manually.

Table 4.12 : Coded Words From Mass Effect Andromeda Reviews

Codes	Description	References
Exploration		4990
Aliens		210
Companions		153
Environment		113
Exploring		704
Galaxies		307
Humans		103
Map		155
Missions		526
Moments		152
Nomad		127
Planets		622
Quest		684
Side Quest		197
Species		89
Squad		88
Travel		129
World		631
Gameplay		4801
Abilities		178
Action		134
Armors		99
Combat		856
Crafting		152
Driving		157
Encounter		117
Enemies		244
Fighting		144
Gameplay		501
Guns		109
Jump		126
Level		203
Mechanics		172
Multiplayer		183
Power		191
Profiles		102
Scanning		92
Shooting		117
Skills		204
Systems		455
Weapons		265
Story		5584
Acting		155
Characters		1346
Choices		292
Crew		172
Cutscenes		108
Dialogue		352
Kett		101
Lore		98
Main Quest		153
Pathfinder		110

Table 4.12 (continued) : Coded Words From Mass Effect Andromeda Reviews

Codes	Description	References
Story		5584
Plot		162
Ryder		307
Scenes		130
Story		1849
Writing		249

We have extracted a total of 54 words from our review analysis of this game. From 3 categories, 15 words were for Story, 22 for Gameplay, and 17 for Exploration.

The combined number of uses for words related to story total 5584, meaning they make 36.32% of the review words. The combined number of uses for words related to gameplay total 4801, meaning they make 31.23% of the review words. The combined number of uses for words related to exploration total 4990, meaning they make 32.46% of the review words.

4.7 Case: Mass Effect Legendary Edition

4.7.1 Description

Mass Effect Legendary Edition is a remastering and re-release of the Mass Effect Trilogy, created by BioWare and published by Electronic Arts on May 14, 2021. Mass Effect Legendary Edition includes single-player base content and over 40 DLC from the highly acclaimed Mass Effect, Mass Effect 2, and Mass Effect 3 games with visual improvements and optimizations for older titles. Mass Effect Legendary Edition sits at a 91.05% and a ‘Very Positive’ review score on Steam.

4.7.2 Achievements

There are a total of 127 achievements in Mass Effect Legendary Edition. 34 of these achievements are for Mass Effect 1, while 44 are for Mass Effect 2, and 38 are for Mass Effect 3. 11 remaining achievements are about playing all three games in the Legendary Edition. List of achievements with their Steam unlock percentages can be found in Table 4.13.

Table 4.13 : Achievements of Mass Effect Legendary Edition Categorized

%	Name	Description	Category
88,20%	Distinguished Service Medal	ME1: Complete Eden Prime	Story
75,90%	Spectre Inductee	ME1: Become a Spectre	Story

Table 4.13 (continued) : Achievements of Mass Effect Legendary Edition
Categorized

%	Name	Description	Category
68,50%	Medal of Exploration I	ME1: Land on an uncharted world	Exploration
65,00%	Search and Rescue	ME1: Locate Dr. T'soni in the Artemis Tau cluster	Story
63,60%	Recruit	Kill 250 enemies in Mass Effect 1, 2 or 3	Gameplay
60,40%	Quarian Ally	ME1: Complete 5 missions with the quarian squad member	Choice
57,20%	Honorarium of Corporate Service	ME1: Complete Noveria	Story
56,80%	Medal of Heroism	ME1: Complete Feros	Story
56,30%	Turian Ally	ME1: Complete 5 missions with the turian squad member	Choice
53,00%	Missing in Action	ME2: Save your crew from an overwhelming attack	Story
52,00%	Council Legion of Merit	ME1: Complete Virmire	Story
52,00%	Very Elusive	ME2: Return to active duty	Story
51,50%	Medal of Exploration II	ME1: Land on 4 uncharted worlds	Exploration
50,60%	Charismatic	ME1: Use Charm or Intimidate to resolve an impossible situation in the game.	Gameplay
49,80%	Meritorious Service Medal	ME1: Complete Ilos	Story
49,80%	Medal of Honor	ME1: Complete the game on any difficulty	Story
49,40%	Asari Ally	ME1: Complete 5 missions with the asari squad member	Choice
49,10%	Merciless	ME2: Make 20 enemies scream as they fall or are set on fire	Gameplay
48,90%	Scholar	ME2: Unlock 15 new Mass Effect 2 codex entries	Exploration
48,70%	The Archangel	ME2: Successfully recruit Archangel	Story
48,50%	The Professor	ME2: Successfully recruit the Professor	Story
48,40%	Soldier	Kill 1,000 enemies in Mass Effect 1, 2 or 3	Gameplay
48,30%	Colonial Savior	ME1: Complete the Bring Down the Sky mission.	Story
48,20%	Scientist	ME2: Complete any research project in the Normandy's laboratory	Gameplay
47,50%	Head Hunter	ME2: Perform 30 headshot kills with any weapon on humanoid targets	Gameplay
46,80%	Principled	ME1: Accumulate 75% of total possible Paragon or Renegade points	Choice
45,20%	The Convict	ME2: Successfully recruit the biotic Convict	Story
44,70%	Paramour I	Establish a romantic relationship in Mass Effect 1, 2 or 3	Choice
44,40%	Operative	ME2: Complete a mission discovered by scanning an unexplored world	Exploration
44,30%	Power Full	ME2: Evolve any power	Gameplay
44,20%	The Krogan	ME2: Successfully recruit the krogan	Story
43,70%	Medal of Exploration III	ME1: Land on 8 uncharted worlds	Exploration
43,70%	Colony Defense	ME2: Defend a human colony from attack	Story
43,20%	Krogan Ally	ME1: Complete 5 missions with the krogan squad member	Choice
43,10%	Broke, Blind, and Bedlam	ME2: Gain the loyalty of the thief	Choice
40,60%	The Assassin	ME2: Successfully recruit the Assassin	Story
40,50%	The Quarian	ME2: Successfully recruit the quarian	Story
40,30%	Ghost Ship	ME2: Complete the investigation of a derelict alien vessel	Story
39,90%	The Justicar	ME2: Successfully recruit the Justicar	Story
39,80%	The Prodigal	ME2: Gain the loyalty of the Cerberus Officer	Choice
39,50%	Revenge!	ME2: Gain the loyalty of the mercenary	Choice
39,20%	Soldier Ally	ME1: Complete 5 missions with the Alliance soldier squad member	Choice
38,60%	Fade Away	ME2: Gain the loyalty of Archangel	Choice
38,60%	Catharsis	ME2: Gain the loyalty of the biotic Convict	Choice

Table 4.13 (continued) : Achievements of Mass Effect Legendary Edition
Categorized

%	Name	Description	Category
38,50%	The Cure	ME2: Gain the loyalty of the Professor	Choice
38,40%	Ghost of the Father	ME2: Gain the loyalty of the Cerberus Operative	Choice
38,40%	Battlemaster	ME2: Gain the loyalty of the krogan	Choice
38,20%	Big Game Hunter	ME2: Thresher Maw defeated	Gameplay
37,90%	Sentinel Ally	ME1: Complete 5 missions with the Alliance sentinel squad member	Choice
37,40%	Heart of Darkness	ME2: Confront the Shadow Broker	Story
37,20%	Treason	ME2: Gain the loyalty of the quarian	Choice
37,10%	Veteran	Kill 2,000 enemies in Mass Effect 1, 2 or 3	Gameplay
36,90%	Cat's in the Cradle	ME2: Gain the loyalty of the Assassin	Choice
36,90%	Digital Exorcist	ME2: Successfully shut down the rogue VI in Project Overlord	Story
36,60%	Doppelganger	ME2: Help the Justicar resolve her mission	Choice
36,40%	Galactic Explorer	ME2: Visit 100% of the planets in an unexplored cluster	Exploration
35,90%	Driven	ME3: Return to active duty.	Story
35,70%	Friend or Foe	ME2: Obtain geth technology	Story
35,30%	Suicide Mission	ME2: Use the Omega 4 Relay	Story
35,20%	Mission Accomplished	ME2: Save humanity throughout the galaxy from certain annihilation	Story
35,20%	Against All Odds	ME2: Survive suicide mission	Story
35,00%	Bringer of War	ME3: Chase down an assassin.	Story
34,50%	Agent	ME2: Complete 5 missions discovered by scanning unexplored worlds	Exploration
34,50%	A House Divided	ME2: Hack a geth collective	Choice
34,50%	Shopaholic	ME3: Visit a store in the single-player campaign.	Exploration
34,10%	A Personal Touch	ME3: Modify a weapon.	Gameplay
34,00%	Focused	ME3: Evolve any of your powers to rank 6.	Gameplay
33,60%	Mobilizer	ME3: Bring a veteran officer aboard.	Story
31,40%	World Shaker	ME3: Destroy an Atlas dropped from orbit.	Gameplay
31,10%	Liberator	ME3: Stop a Cerberus kidnapping.	Story
31,00%	Untouchable	ME3: Escape a Reaper in the galaxy map.	Gameplay
30,90%	Weapon Specialist	ME2: Fully upgrade a weapon	Gameplay
30,70%	Giant Killer	ME3: Defeat a harvester.	Gameplay
30,70%	Eye of the Hurricane	ME3: Kill a brute while it's charging you.	Gameplay
30,50%	Completionist	ME1: Complete the majority of the game	Exploration
30,00%	Tunnel Rat	ME3: Survive the swarm.	Exploration
29,60%	Pathfinder	ME3: Explore a lost city.	Story
29,30%	No One Left Behind	ME2: Keep your team alive through the suicide mission	Choice
29,20%	Arbiter	ME3: Win a political stand-off.	Story
28,40%	First Aid Specialist	ME1: Use medi-gel 50 times	Gameplay
28,40%	Savior	ME3: Free Omega from Cerberus Occupation.	Story
27,40%	Lost and Found	ME3: Dispatch 10 probes to retrieve people or resources in Reaper territory.	Exploration
27,30%	Party Crasher	ME3: Sabotage a dreadnought.	Story
27,20%	Problem Solver	ME3: Evacuate a scientific facility.	Exploration
27,10%	Fact Finder	ME3: Discover an enemy's monstrous origin.	Exploration
27,00%	Paramour II	Establish or rekindle a romantic relationship in two games in Mass Effect Legendary Edition	Choice

Table 4.13 (continued) : Achievements of Mass Effect Legendary Edition
Categorized

%	Name	Description	Category
26,70%	Under Pressure	ME3: Uncover an ancient secret.	Story
26,50%	Hard Target	ME3: Call down an orbital strike.	Story
26,00%	Archivist	ME1: Find all primary Alien: Council Races, Extinct Races and Non-Council Races codex entries	Exploration
26,00%	Saboteur	ME3: Disable a group of fighter squadrons.	Exploration
25,50%	Last Resort	ME3: Stop an out-of-control scheme before it's too late.	Exploration
25,20%	Last Witness	ME3: Extract ancient technology.	Story
24,70%	Well Connected	ME3: Send a warning across the galaxy.	Story
24,20%	Master and Commander	ME3: Deliver most of the Galaxy at War assets to the final conflict.	Exploration
23,10%	Executioner	ME3: Defeat an old adversary.	Story
23,00%	Throw Mastery	ME1: Use biotic Throw 25 times	Gameplay
22,70%	Patriot	ME3: Make the final assault.	Story
22,30%	Legend	ME3: Mission accomplished.	Story
22,00%	Pyromaniac	ME3: Set 100 enemies on fire with powers.	Gameplay
21,30%	Long Service Medal	Finish Mass Effect 1, 2 and 3 with the same character	Choice
19,90%	Electronics Specialist	ME1: Use Shield Overload 25 times	Gameplay
19,40%	Sabotage Specialist	ME1: Use Sabotage 25 times	Gameplay
19,40%	Combined Arms	ME3: Perform any combination of 50 biotic combos or tech bursts.	Gameplay
18,40%	Mail Slot	ME3: Kill 10 guardians with headshots from the front while their shields are raised.	Gameplay
17,30%	Warp Mastery	ME1: Use biotic Warp 25 times	Gameplay
17,10%	Overload Specialist	ME2: Disrupt the shields of 25 enemies	Gameplay
16,70%	Barrier Mastery	ME1: Use biotic Barrier 25 times	Gameplay
16,60%	Sky High	ME3: Lift 100 enemies off the ground with powers.	Gameplay
14,80%	Lift Mastery	ME1: Use biotic Lift 25 times	Gameplay
12,40%	Bruiser	Kill 100 enemies with melee attacks in Mass Effect 1, 2 or 3	Gameplay
11,70%	Paramour III	Establish or rekindle a romantic relationship in all three games in Mass Effect Legendary Edition	Choice
11,40%	Always Prepared	ME3: Obtain two non-customizable suits of armor.	Gameplay
10,90%	Hijacker	ME3: Hijack an Atlas mech.	Gameplay
10,00%	Singularity Mastery	ME1: Use biotic Singularity 25 times	Gameplay
9,20%	Incineration Specialist	ME2: Incinerate the armor of 25 enemies	Gameplay
8,80%	Shield Breaker	ME3: Overload the shields of 100 enemies.	Gameplay
8,50%	Warp Specialist	ME2: Warp the barriers of 25 enemies	Gameplay
8,30%	Damping Specialist	ME1: Use Damping Field 25 times	Gameplay
8,20%	Insanity I	Complete Mass Effect 1, 2 or 3 on Insanity without changing difficulty	Gameplay
6,80%	Tactician	ME2: Hit 20 different targets with multiple biotic powers to combine the effects	Gameplay
5,10%	Insanity II	Complete two games in Mass Effect Legendary Edition on Insanity without changing difficulty	Gameplay
5,00%	Stasis Mastery	ME1: Use biotic Stasis 25 times.	Gameplay
4,60%	AI Hacking Specialist	ME1: Use AI Hacking 25 times	Gameplay
4,40%	Neural Shock Specialist	ME1: Use Neural Shock 25 times	Gameplay
3,10%	Insanity III	Complete all three games in Mass Effect Legendary Edition on Insanity without changing difficulty	Gameplay
2,40%	The One and Only	ME3: Defeat a group of Spectre-level opponents on Normal, Hardcore, or Insanity.	Gameplay
2,40%	Gunsmith	ME3: Upgrade any weapon to level 10.	Gameplay

Our categories for achievements in Mass Effect Legendary Edition include story, gameplay, exploration, and choice. Choice achievements are categorized separately for their relationship to squad mate characters and their loyalty missions.

The achievement with the highest percentage of unlocks is ‘Distinguished Service Medal’ at 88.2%. This achievement is a story achievement. The achievements with the lowest percentage of unlocks are ‘The One and Only’ and ‘Gunsmith’ at 2.4%. These achievements are both gameplay achievements. Average unlock rate of achievements for Mass Effect Legendary Edition is 33.19%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 41 story achievements, ranging from 88.2% completion and 22.3% completion with an average of 40.89%. There are a total number of 45 gameplay achievements, ranging from 63.6% completion and 2.4% completion with an average of 22.32%. There are a total number of 17 exploration achievements, ranging from 68.5% completion and 24.2% completion with an average of 35.66%. There are a total number of 24 choice achievements, ranging from 60.4% completion and 11.7% completion with an average of 38.64%.

The achievement players unlock for finishing the main storyline of the main game is ‘Legend’, this story achievement has an unlock rate of 22.3%, 18.59% lower than the average story achievement unlock rate and 10.89% lower than the average achievement unlock rate.

4.7.3 Reviews

We have compiled a list of user reviews for Mass Effect Legendary Edition from Steam between 15.05.2021 and 12.09.2021. There are a total of 10780 user reviews made between these dates. 10182 of these reviews are tagged positive for recommendation, giving us a percentage of 94.45% positive sentiment towards the game. Table 4.14 shows the list of nodes created and categorized manually.

Table 4.14 : Coded Words From Mass Effect Legendary Edition Reviews

Codes	Description	References
Exploration		5975
Aliens		202
Areas		119
Building		180
Choices		531
Citadel		169

Table 4.14 (continued) : Coded Words From Mass Effect Legendary Edition

Reviews		
Codes	Description	References
Exploration		5975
Collectables		217
Companions		148
Conversations		119
Crew		127
Dating		89
Exploration		244
Galaxy		233
Garrus		214
Liara		137
Lore		180
Mako		533
Normandy		109
Paragon		114
Planets		236
Renegade		129
Romance		184
Side Quest		145
Space		329
Squad		134
Tali		188
Universe		262
World		473
Wrex		230
Gameplay		4531
Abilities		152
Action		239
Biotics		96
Classes		175
Combat		747
Commands		42
Enemies		249
Gameplay		822
Guns		148
Killing		137
Mechanics		255
Multiplayer		385
Powers		206
Shooting		169
Systems		379
Weapons		330
Story		7441
Character		1484
Dialogue		251
Ending		1138
Journey		133
Mission		500
Moments		198
Narrative		94
Plot		100
Shepard		880

Table 4.14 (continued) : Coded Words From Mass Effect Legendary Edition Reviews

Codes	Description	References
Story		7441
Story		2192
Storytelling		91
Voice		141
Writing		239

We have extracted a total of 57 words from our review analysis of [Mass Effect Legendary Edition]. From 3 categories, 13 words were for Story, 16 for Gameplay, and 28 for Exploration.

The combined number of uses for words related to story total 7441, meaning they make 41.46% of the review words. The combined number of uses for words related to gameplay total 4531, meaning they make 25.25% of the review words. The combined number of uses for words related to exploration total 5975, meaning they make 33.29% of the review words.

4.8 Case: Deus Ex: Human Revolution

4.8.1 Description

Deus Ex Human Revolution is an action role-playing game developed by Eidos Montréal and published by Square Enix on August 23, 2011. Human Revolution is a prequel to the original game of the series, Deus Ex (Ion Storm, 2000). Set in a cyberpunk setting, player controls Sarif Industries security officer Adam Jensen. Deus Ex: Human Revolution combines first-person shooter and stealth mechanics as the player advances through both main story and optional side quests where they complete objectives and clear enemy encounters, rewarded by experience points and equipment. The player has story and gameplay choices throughout these quests which allow for an interactive storytelling experience. Deus Ex: Human Revolution was re-released on Steam as Deus Ex: Human Revolution – Director’s Cut on October 25, 2013. Deus Ex: Human Revolution – Director’s Cut sits at a 90.15% and a ‘Very Positive’ review score on Steam.

4.8.2 Achievements

There are a total of 59 achievements in Deus Ex: Human Revolution. 49 of these achievements have been a part of the game since its initial release, while 10

achievements were added with the missing link expansion. List of achievements with their Steam unlock percentages can be found in Table 4.15.

Table 4.15 : Achievements of Deus Ex: Human Revolution Categorized

%	Name	Description	Category
74,40%	First Takedown	Perform your first Takedown. Civilians don't count, so be nice.	Gameplay
71,50%	First Hack	Perform your first Hack successfully.	Gameplay
56,50%	Ghost	You made it through an entire hostile area without making so much as a squeak.	Gameplay
54,00%	Unforeseen Consequence	You convinced Zeke Sanders to let his hostage go.	Choice
50,20%	Up the Ante!	Upgrade your first weapon of choice.	Gameplay
46,20%	Lesser Evil	Deal with Mr. Carella's indiscretion.	Exploration
44,00%	Transhumanist	Fully upgrade your first augmentation of choice.	Gameplay
43,40%	Motherly Ties	Put a grieving mother's doubts to rest.	Exploration
43,30%	The Bull	You defeated Lawrence Barrett, elite member of a secret mercenary hit squad.	Story
41,20%	The Desk Job	You convinced Wayne Haas to let you into the morgue.	Choice
37,60%	Yes Boss	You had an argument with your boss, David Sarif, and won.	Choice
34,30%	Hax0r1!	Successfully hack at least 50 devices within the same playthrough.	Gameplay
32,80%	The Mantis	You defeated Yelena Federova, elite member of a secret mercenary hit squad.	Story
32,30%	Darker Shades	You convinced a fast-talking bartender to let you see Tong Si Hung.	Exploration
31,80%	Rotten Business	Help a lady in the oldest of professions clean house.	Exploration
31,80%	Shanghai Justice	It may take some sleuthing, but justice must be served.	Exploration
31,50%	Super Sleuth	You really nailed your case against Lee Hong.	Exploration
31,20%	Opportunist	Perform 50 takedowns within the same playthrough. (Civilians don't count).	Gameplay
29,90%	Smash the State	Help Officer Nicholas take out the trash.	Exploration
29,00%	Bar Tab	Help the Hive Bartender settle a tab.	Exploration
28,70%	Out of the Frying Pan	You made it off the boat... but to what end?	Story
27,60%	Corporate Warfare	Protect a client's interests by performing a less-than-hostile takeover.	Exploration
26,80%	Never Stop Looking	You escaped Rifleman Bank Station. Nothing will stop you from finding Megan now.	Story
26,60%	Good Samaritan	You replaced the power supply on a damaged stasis pod, saving the occupant's life.	Exploration
26,30%	Consciousness is Over-rated	Knock out at least 100 enemies in a single playthrough.	Gameplay
26,10%	The Snake	You defeated Jaron Namir, Leader of Belltower's Elite Special Operations Unit.	Story
25,60%	Cloak & Daggers	Deal with the man in the shadows.	Exploration
25,50%	The End	You defeated Zhao Yun Ru and by doing so, destroyed the Hyron Project.	Story
25,40%	Trooper	Complete Deus Ex: Human Revolution - Director's Cut.	Story

Table 4.15 (continued) : Achievements of Deus Ex: Human Revolution

%	Name	Description	Category
23,80%	The Final Countdown	You pointed out the flaws in his logic to millionaire Hugh Darrow.	Story
22,80%	The Last Straw	You talked Doctor Isaías Sandoval out of suicide.	Story
20,10%	Guardian Angel	You paid poor Jaya's debt in full. How very... humane... of you.	Choice
20,00%	Acquaintances Forgotten	Follow Pritchard's lead to uncover the truth.	Exploration
19,80%	The Throwdown	You convinced the smooth-talking politician Bill Taggart to tell the truth in public.	Story
18,30%	Good Soul	Against all odds, you saved Faridah Malik's life.	Choice
16,70%	Ladies Man	You convinced Mengyao to spill the beans on the mysterious Hyron Project.	Choice
16,50%	The Fall	You sent Diamond Chan on the trip of a lifetime.	Choice
14,10%	Talion A.D.	Descend into the bowels of an urban jungle and confront a warrior-priest.	Exploration
12,40%	The learn'd Scholar	When the proofs, the figures, were ranged in columns before me...	Story
12,20%	Balls	Seems you like playing with balls, eh?	Exploration
12,00%	Gun Nut	Fully upgrade one of your weapons.	Gameplay
10,30%	All of the Above	You managed to save Dr. Kavanagh and all the prisoners, too.	Choice
10,30%	Back Stage Pass	You gained access to Quinn's secret store.	Exploration
10,00%	Apex Predator	You performed a takedown on Burke without being detected.	Gameplay
9,70%	Kevorkian Complex	You granted a dying man his final request.	Choice
9,40%	Deus Ex Machina	Experience all the different endings that Deus Ex: Human Revolution - Director's Cut has to offer.	Story
8,90%	Lucky Guess	Next time, Jacob better use a more complex code to arm his bombs.	Exploration
8,80%	That Old Adage	Apparently, your CASIE augmentation doesn't work on everyone...	Story
8,50%	The D Project	You watched the entire credit list and saw the surprise at the end.	Story
8,10%	Old School Gamer	You found all the hidden story items in Megan's Office. Point-and-Click much?	Exploration
7,80%	Legend	Complete Deus Ex: Human Revolution - Director's Cut at its hardest setting without ever changing the difficulty.	Gameplay
7,00%	Hangar 18	You found and read the secret message. Now you know too much...	Exploration
6,80%	Sentimental Value	You kept Megan's bracelet for yourself. Apparently, letting go really is the hardest part.	Choice
5,70%	Never Forget	You revisited the site where Belltower discovered and captured you.	Exploration
5,40%	The Take	Greedy bastard. You accepted O'Malley's blood money and let him go.	Choice
3,90%	Pacifist	Complete Deus Ex: Human Revolution - Director's Cut without anyone dying by your hand. (Boss fights don't count).	Gameplay
3,20%	Foxiest of the Hounds	Complete Deus Ex: Human Revolution - Director's Cut without setting off any alarms.	Gameplay
2,50%	Factory Zero	You survived The Missing Link using no Praxis kits, weapons, or explosives. Whoa.	Gameplay
2,40%	Doctorate	Read all 29 unique XP books within a single playthrough.	Exploration

Our categories for achievements in Deus Ex: Human Revolution include story, gameplay, exploration, and choice. Choice achievements are categorized separately because of numerous side-quests where the player can choose certain story options depending on whether they've done the necessary previous choices.

The achievement with the highest percentage of unlocks is 'First Takedown' at 74.4%. This achievement is a gameplay achievement. The achievement with the lowest percentage of unlocks is Doctorate at 2.4%. This achievement is an exploration achievement. Average unlock rate of achievements for Deus Ex: Human Revolution is 24.12%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 14 story achievements, ranging from 43.3% completion and 8.5% completion with an average of 22.44%. There are a total number of 14 gameplay achievements, ranging from 74.4% completion and 2.5% completion with an average of 30.56%. There are a total number of 20 exploration achievements, ranging from 46.2% completion and 2.4% completion with an average of 22.22%. There are a total number of 11 choice achievements, ranging from 54% completion and 5.4% completion with an average of 21.51%.

The achievement players unlock for finishing the main storyline of the main game is 'Trooper', this story achievement has an unlock rate of 25.4%, 2.96% higher than the average story achievement unlock rate and 1.28% higher than the average achievement unlock rate.

4.8.3 Reviews

We have compiled a list of user reviews for Deus Ex: Human Revolution from Steam between 13.01.2021 and 12.09.2021. There are a total of 1060 user reviews made between these dates. 979 of these reviews are tagged positive for recommendation, giving us a percentage of 92.36% positive sentiment towards the game. Table 4.16 shows the list of nodes created and categorized manually.

Table 4.16 : Coded Words From Deus Ex: Human Revolution Reviews

Codes	Description	References
Choice		217
Choices		85
Choosing		51
Options		40

Table 4.16 (continued) : Coded Words From Deus Ex: Human Revolution Reviews

Codes	Description	References
Choice		217
Replayability		41
Exploration		581
Areas		38
Atmosphere		33
Experience		81
Exploration		42
Immersive		47
Level		70
People		61
Setting		24
Side Quests		71
World		114
Gameplay		1810
Approach		48
Augments		121
Bosses		68
Combat		71
Enemies		76
Fighting		50
FPS		54
Gameplay		172
Guns		60
Hacking		86
Kill		59
Lethal		69
Missions		77
Objective		25
Original		143
Progression		31
RPG		60
Shooting		39
Skills		49
Stealth		196
Takedowns		29
Upgrades		66
Using		98
Weapons		63
Story		1008
Adam		60
Characters		119
Cyberpunk		160
Dialogue		52
Jensen		79
Main Quest		89
Plot		44
Story		369
Voice Acting		36

We have extracted a total of 47 words from our review analysis of Deus Ex: Human Revolution. From 4 categories, 9 words were for Story, 24 for Gameplay, 10 for Exploration, and 4 for Choice.

The combined number of uses for words related to story total 1008, meaning they make 27.88% of the review words. The combined number of uses for words related to

gameplay total 1810, meaning they make 50.06% of the review words. The combined number of uses for words related to exploration total 581, meaning they make 16.07% of the review words. The combined number of uses for words related to choice total 217, meaning they make 6.00% of the review words.

4.9 Case: Deus Ex: Mankind Divided

4.9.1 Description

Deus Ex: Mankind Divided is an action role-playing game developed by Eidos Montréal and published by Square Enix on August 23, 2016. Deus Ex: Mankind Divided is a sequel to Deus Ex: Human Revolution, set two years after the events which divided the world between augmented and non-augmented people. Similar to Deus Ex: Human Revolution, in Deus Ex: Mankind Divided players continue controlling Adam Jensen. Deus Ex: Mankind Divided also combines first-person shooter and stealth mechanics as the player advances through both main story and optional side quests where they complete objectives and clear enemy encounters, rewarded by experience points and equipment. The player has story and gameplay choices throughout these quests which allow for an interactive storytelling experience. Deus Ex: Mankind Divided sits at a 73.42% and a 'Mostly Positive' review score on Steam.

4.9.2 Achievements

There are a total of 81 achievements in Deus Ex: Mankind Divided. 50 amount of these achievements have been a part of the game since its initial release, while 8 have been released with System Rift, 13 with Breach Mode and, 10 with A Criminal Past expansions. List of achievements with their Steam unlock percentages can be found in Table 4.17.

Table 4.17 : Achievements of Deus Ex: Mankind Divided Categorized

%	Name	Description	Category
59,90%	Singh No Swan Song	Have Singh's back when it matters most.	Gameplay
56,70%	Humanity +	Fully upgrade a branch of your Augmentation Tree.	Gameplay
56,00%	I Can Only Fight Enemies I Can See	Complete one Hacking Challenge with Fog Security without using a Reveal Software.	Gameplay
54,80%	Ghost	Cross enemy territory like a ghost, raising no hostile reaction from anyone.	Challenge
48,60%	And Embrace What You've Become	Install at least one experimental augmentation.	Gameplay

Table 4.17 (continued) : Achievements of Deus Ex: Mankind Divided

%	Name	Description	Category
40,90%	Honor Holds Us All Together	You completed the debate with Otar Botkoveli.	Exploration
37,80%	Samizdat	You opted to work with the Samizdat group & spread their news throughout Picus media streams.	Choice
36,60%	The Golden Ticket	You made a tough decision as to whether Irenka Bauer or Edward Brod would get to stay in Prague.	Choice
34,90%	Fresh Out of the Package	With Koller's help and the Neuroplasticity Calibrator, eliminate overclocking for experimental augs.	Exploration
34,40%	Between Technology and the Divine	Complete & win the debate with Talos Rucker.	Choice
33,10%	Adept of the Metaverse	Engage in all Tutorials in Adam's first mission in Dubai.	Gameplay
31,00%	Neon Nights	You halted the production of Neon in the city.	Exploration
30,80%	We Are Human Beings	You completed Deus Ex: Mankind Divided on any difficulty.	Story
29,20%	Handle with Care	You helped Olivie escape Prague.	Exploration
26,70%	Spokes in Two Wheels	You managed to stop both the bombing & the Orchid poisoning. You're a living legend!	Challenge
25,90%	K is for Kazdy	You freed K and Bones from the prison cell and escorted them to safety.	Exploration
25,60%	God Killer	You completed the debate with Allison Stanek.	Choice
25,10%	The Supreme Enlightened	You watched the End Credits and found the surprise inside.	Story
19,10%	Ground Mail Was a Better Option	Flawlessly disable a Drone via Remote Hacking.	Gameplay
18,60%	All in the Family	You aided Otar when he sought help with a family matter.	Choice
17,20%	01011000	You pieced together the mysterious contact and aided Helle in remembering who she really is.	Exploration
16,20%	The Net Is Vast and Infinite	Using Jim's keycard, you infiltrated the NSN and viewed a recording without triggering any alarms.	Gameplay
15,60%	Ruthless Efficiency	Fully upgrade a weapon of your choice.	Gameplay
14,30%	Cult of Personality	By uncovering the key to Richard's persuasive powers, you broke his control and freed his followers.	Exploration
14,10%	So Many Cucumbers	Deus Ex Is All About Cucumbers...	Gameplay
13,20%	Core Driller	Use the Ice Drill to bypass a large section of the GARM facility.	Choice
13,20%	The Harvester	You convinced Detective Montag that neither Gunn nor Radko could be the murderer.	Choice
11,20%	The Last Harvest	Using the CASIE and Dr. Cipra's keyword, you convinced Daria she isn't who she thinks she is.	Exploration
9,50%	He's [Not] Dead, Jim	By using the Antidote, you saved the life of Jim Miller.	Choice
8,20%	Pacifist	You completed Deus Ex: Mankind Divided without killing a single soul. Bosses are people, too.	Challenge
6,90%	A Heated Combination	Enter a classic numerical code in the game's first keypad.	Exploration
6,30%	Laputan Machine	You used Marchenko's Kill Switch to defeat him, proving that some things can cut deeper than steel.	Choice
5,80%	The Jack of All Augments	Invest in at least one augmentation in every branch of the Aug Tree.	Gameplay
5,70%	A Just Cause	Decide what to do with the Altered Biocell.	Choice
5,70%	Go Figure	Plant ShadowChild's figurine.	Exploration
5,60%	Expose the Truth!	Decide what to do with the evidence you uncovered.	Choice
5,60%	Extract the Data...	Get the data that Pritchard is after from within the Palisade Blade.	Story
5,30%	A Criminal Past	Complete A Criminal Past.	Story
5,30%	Help Desk	Get the Blade lobby desk clerk to help you bypass security.	Exploration

Table 4.17 (continued) : Achievements of Deus Ex: Mankind Divided

%	Name	Description	Category
5,10%	****! Taser Fist!	Lock-On and deploy the Quad Arc upgrade of the Tesla Knuckle on four enemies at once.	Gameplay
4,50%	Dressed for the Occasion	Blend in with the proper prisoner jumpsuit.	Choice
4,40%	Smooth Like Soap	Find Mejia in Cell Block B without raising an alarm.	Exploration
4,40%	Umlauts or no Umlauts	Decide the Fixer's fate.	Story
4,20%	Quid Pro Quo	Help out a fellow inmate by making a trade.	Exploration
4,10%	Murder He Wrote	Find all pieces of evidence behind the Saridakis murder.	Exploration
4,00%	Ballsy	You Know What To Do.	Exploration
4,00%	Clean Sweep	Complete the System Rift Jensen Story without killing anyone.	Challenge
3,90%	Time Traveler	You managed to bring Koller the Neuroplasticity Calibrator before he even asked you for it.	Exploration
3,80%	The Golden Rookery	Find the missing Gold Penguin and return him back to his colony.	Exploration
3,70%	Invisible War	Incapacitate a cloaked enemy while remaining cloaked yourself.	Gameplay
3,70%	The Invincible Body, Fighting an Iron Devil	Block an incoming enemy explosive with the Titan Shield.	Gameplay
3,60%	Too Hot to Handle	Complete the server chamber area without being detected by any HeatEye cameras or enemies.	Challenge
3,30%	Code of Conduct	Complete A Criminal Past without killing anyone.	Challenge
3,10%	Knock Knock	Get Slaw to open the security door within the Palisade Blade.	Choice
3,10%	This is Great for Spring Cleaning	Use both Knockback & Precision functions of the P.E.P.S. Arm Cannon at least once.	Gameplay
3,00%	Ramming Speed!!	Ram Dash into an enemy NPC with a fully charged Icarus Dash.	Gameplay
2,30%	Express Elevator to Hell, Going Down	Land an Icarus Landing & Strike on foes and clear out the pack with the Typhoon. Just to make sure.	Gameplay
1,90%	Objection!	Get Mejia to confess to murdering Wilburg.	Story
1,90%	Winners Don't Use Drugs (or Biocells)	Complete A Criminal Past without using the Fixer Pill or the Altered Biocell.	Choice
1,80%	Don't Reach, Kid	Find the basketball and put it in the hoop.	Exploration
1,70%	Data Detective	Breach: Complete a Darknet file.	Breach
1,70%	Foxiest of the Hounds	You triggered zero alarms during an entire playthrough.	Challenge
1,60%	Slow & Sharp	Land an Explosive Nanoblade Shot on three enemies at once while the Focus Augmentation is active.	Gameplay
1,30%	Fire Sale	Breach: Destroy 2 enemies at once using a Red Unstable Cube.	Breach
1,20%	I Never Asked For This	You completed Deus Ex: Mankind Divided™ on the highest possible difficulty. Hats off.	Challenge
1,20%	Tablet Collector	Collect and read every unique eBook.	Exploration
1,00%	Data Disciple	Breach: Complete all Versalife, Steiner-Bisley and Tarvos servers in Tier 1 Network.	Breach
0,90%	A Heist of Olympic Proportions	Breach: Complete 5 PICUS Servers.	Breach
0,90%	Ashes to Ashes	Breach: Complete the Santeau Darknet File.	Breach
0,90%	Bad Sector	Breach: Complete 5 Ghost Servers.	Breach
0,90%	Burning Neodymium	Breach: Eliminate a Prime Unit while the Titan.aug is active.	Breach
0,90%	Camera, Action, Red-Handed	Breach: Complete the PICUS Darknet File.	Breach
0,90%	Data Emperor	Breach: Complete 5 Tier 4 Network servers.	Breach
0,90%	Data Expert	Breach: Complete all Versalife, Steiner-Bisley and Tarvos servers in Tier 2 Network.	Breach

Table 4.17 (continued) : Achievements of Deus Ex: Mankind Divided

%	Name	Description	Category
0,90%	Data Master	Breach: Complete all Versalife, Steiner-Bisley and Tarvos servers in Tier 3 Network.	Breach
0,90%	Excess Baggage Fees	Breach: Complete a server using 6 Expansion Items at once.	Breach
0,90%	Hourglass	Breach: Complete 10 Santeau servers.	Breach
0,90%	Not The Rippers You Are Looking For	Breach: Use the Alarm_Cancel.pkg in a server.	Breach
0,90%	Now I'm Feeling A Little Motivated	Breach: Win 3 Challenges.	Breach
0,90%	The 40-Yard Digital Dash	Breach: Succeed 3 Data Sphere deliveries.	Breach
0,90%	You're Not Worthy As My Opponent	Breach: Send 3 Challenges.	Breach

Our categories for achievements in Deus Ex: Mankind Divided include story, gameplay, exploration, as well as choice, challenge, and Breach. Choice achievements are like the ones in Deus Ex: Human Revolution as they are rewards for players making certain decisions available. Challenge achievements are rewards for playing the game in a harder non-lethal playthrough, not killing any enemies. Breach achievements are for the alternative game mode Breach.

The achievement with the highest percentage of unlocks is ‘Singh No Swan Song’ at 59.9%. This achievement is a gameplay achievement. The achievement with the lowest percentage of unlocks is ‘You’re Not Worthy As My Opponent’ at 0.9%. This achievement is a Breach achievement. Average unlock rate of achievements for Deus Ex: Human Revolution is 12.43%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 6 story achievements, ranging from 30.8% completion and 1.9% completion with an average of 12.18%. There are a total number of 17 gameplay achievements, ranging from 59.9% completion and 1.6% completion with an average of 20.45%. There are a total number of 19 exploration achievements, ranging from 40.9% completion and 1.2% completion with an average of 13.15%. There are a total number of 14 choice achievements, ranging from 37.8% completion and 1.9% completion with an average of 15.43%. There are a total number of 8 challenge achievements, ranging from 54.8% completion and 1.2% completion with an average of 12.94%. There are a total number of 17 Breach achievements, ranging from 1.7% completion and 0.9% completion with an average of 0.98%.

The achievement players unlock for finishing the main storyline of the main game is ‘We Are Human Beings’, this story achievement has an unlock rate of 30.8%, 18.62%

higher than the average story achievement unlock rate and 18.37% higher than the average achievement unlock rate.

4.9.3 Reviews

We have compiled a list of user reviews for Deus Ex: Mankind Divided from Steam between 23.11.2019 and 12.09.2021. There are a total of 4060 user reviews made between these dates. 3337 of these reviews are tagged positive for recommendation, giving us a percentage of 82.19% positive sentiment towards the game. Table 4.18 shows the list of nodes created and categorized manually.

Table 4.18 : Coded Words From Deus Ex: Mankind Divided Reviews

Codes	Description	References
Breach		109
Breach		109
Challenge		165
Challenge		79
Difficulty		86
Choice		461
Choices		245
Choosing		65
Decisions		71
Paths		80
Exploration		3586
Apartments		69
Atmosphere		117
Building		82
City		191
Crafted		22
Details		200
Environment		90
Experience		267
Exploration		360
Immersion		218
Locations		110
Map		138
NPCs		124
Police		53
Prague		285
Progression		115
Quests		330
Reading		94
Secret		67
Sidequests		47
World		607
Gameplay		4779
Abilities		132
Ammo		82
Approaches		138

Table 4.18 (continued) : Coded Words From Deus Ex: Mankind Divided Reviews

Codes	Description	References
Gameplay		4779
Augmentations		348
Augs		238
Combat		144
Crafting		40
Enemies		133
Fights		131
Game Mode		129
Gameplay		761
Guns		167
Hacking		250
Inventory		69
Items		94
Kill		179
Lethal/Non-Lethal		104
Mechanics		252
Modes		129
Powers		68
Shooting		119
Skills		84
Sneak		97
Stealth		466
Unlocks		56
Upgrades		145
Vents		54
Weapons		170
Story		4772
Acting		78
Acts		44
Adam		183
Boss		136
Campaign		71
Characters		444
Dialogue		131
Ending		695
Engagement		80
Jensen		330
Narrative		97
Plot		215
Story		1934
Storyline		94
Theme		65
Voice		89
Writing		86

We have extracted a total of 72 words from our review analysis of Deus Ex: Mankind Divided. From 6 categories, 17 words were for Story, 28 for Gameplay, 21 for Exploration, 4 for Choice, 2 for Challenge, and 1 for Breach.

The combined number of uses for words related to story total 4772, meaning they make 34.40% of the review words. The combined number of uses for words related to

gameplay total 4779, meaning they make 34.45% of the review words. The combined number of uses for words related to exploration total 3586, meaning they make 25.85% of the review words. The combined number of uses for words related to choice total 461, meaning they make 3.32% of the review words. The combined number of uses for words related to challenge total 165, meaning they make 1.19% of the review words. The combined number of uses for words related to breach total 109, meaning they make 0.79% of the review words.

4.10 Case: Cyberpunk 2077

4.10.1 Description

Cyberpunk 2077 is an action role-playing game developed and published by CD Projekt RED on December 10, 2020. Set in the megalopolis Night City, the player controls V, a player created mercenary with skills in hacking, weaponry, and combat which the player can improve using experience points earned through playing the game. The player can traverse Night City via walking or driving, completing main story and optional side quests which require the player to complete objectives ranging from item delivery to dealing with enemies. Due to its relatively rushed release with incomplete gameplay elements and massive number of bugs and glitches encountered by some players, Cyberpunk 2077 received mixed reviews. After a year post-release with free updates improving performance and fixing bugs, Cyberpunk saw ‘Mostly Positive’ reviews for the first time on November 26, 2021. [47] Cyberpunk 2077 sits at a 75.23% and a ‘Mostly Positive’ review score on Steam.

4.10.2 Achievements

There are a total of 44 achievements in Cyberpunk 2077. 44 of these achievements have been a part of the game since its initial release. List of achievements with their Steam unlock percentages can be found in Table 4.19.

Table 4.19 : Achievements of Cyberpunk 2077 Categorized

%	Name	Description	Category
90,10%	The Fool	Become a mercenary.	Story
71,50%	The Lovers	Steal the Relic.	Story
69,90%	Right Back At Ya	Kill or incapacitate an enemy who threw a grenade at you.	Gameplay
53,70%	The Wheel of Fortune	Interrogate Anders Hellman.	Story

Table 4.19 (continued) : Achievements of Cyberpunk 2077 Categorized

%	Name	Description	Category
51,90%	Stanislavski's Method	Use a dialogue option related to V's life path 10 times.	Choice
49,00%	The Hermit	Find Alt Cunningham.	Story
43,10%	The High Priestess	Talk with Hanako Arasaka.	Story
42,20%	True Soldier	Kill or incapacitate 300 enemies using ranged weapons.	Gameplay
38,20%	Life of the Road	Complete Panam Palmer's storyline.	Choice
35,30%	Legend of The Afterlife	Reach max Street Cred.	Gameplay
33,30%	The World	Complete the main storyline.	Story
29,80%	Two Heads, One Bullet	Kill or incapacitate 2 enemies with the same sniper rifle shot.	Gameplay
29,60%	Bushido and Chill	Watch Bushido X with Rogue.	Choice
29,30%	Full Body Conversion	Install at least one implant in each system and body part.	Gameplay
27,30%	Judy vs Night City	Complete Judy Alvarez's storyline.	Choice
26,90%	True Warrior	Kill or incapacitate 100 enemies using melee weapons.	Gameplay
24,40%	To Protect and Serve	Complete River Ward's storyline.	Choice
21,80%	Master Crafter	Craft 3 Legendary items.	Gameplay
21,70%	Christmas Tree Attack	Complete a Breach Protocol with a minimum of 3 daemons uploaded.	Gameplay
20,70%	Frequent Flyer	Find all fast travel dataterms.	Exploration
17,90%	The Wandering Fool	Find all the tarot graffiti for the job Fool on the Hill.	Exploration
15,40%	The Star	Leave Night City with the Aldecaldos. (One of several endings).	Choice
13,40%	Breathtaking	Collect all items that once belonged to Johnny Silverhand.	Exploration
13,10%	The Quick and the Dead	Kill or incapacitate 50 enemies while time is slowed.	Gameplay
12,70%	Gun Fu	Kill or incapacitate 3 enemies in quick succession with a revolver or pistol in close combat.	Gameplay
12,50%	The Sun	Become a legend of the Afterlife. (One of several endings).	Choice
11,80%	I Am The Law	Complete all Cyberpsycho Sightings.	Exploration
11,30%	Ten out of Ten	Reach the max level in any skill.	Gameplay
10,20%	To Bad Decisions!	Complete Kerry Eurodyne's storyline.	Choice
9,00%	Must Be Rats	Perform the Distract Enemies quickhack 30 times without drawing attention to yourself.	Gameplay
9,00%	Temperance	Let Johnny Silverhand keep your body. (One of several endings).	Choice
6,30%	City Lights	Complete all gigs and NCPD Scanner Hustles in City Center.	Exploration
5,90%	Mean Streets	Complete all gigs and NCPD Scanner Hustles in Heywood.	Exploration
5,80%	The Jungle	Complete all gigs and NCPD Scanner Hustles in Santo Domingo.	Exploration
5,50%	It's Elementary	Complete all gigs and NCPD Scanner Hustles in Watson.	Exploration
5,50%	Little Tokyo	Complete all gigs and NCPD Scanner Hustles in Westbrook.	Exploration
5,40%	Greetings from Pacifica!	Complete all gigs and NCPD Scanner Hustles in Pacifica.	Exploration
5,20%	The Wasteland	Complete all gigs and NCPD Scanner Hustles in the Badlands.	Exploration
5,00%	Autojock	Buy all vehicles available for purchase.	Exploration
4,80%	Gunslinger	Shoot an enemy grenade in midair with a revolver.	Gameplay
4,50%	V for Vendetta	After reviving with Second Heart, kill or incapacitate the enemy who killed you within 5 seconds.	Gameplay

Table 4.19 (continued) : Achievements of Cyberpunk 2077 Categorized

%	Name	Description	Category
4,40%	The Devil	Help Takemura avenge the death of Saburo Arasaka. (One of several endings).	Choice
4,30%	Daemon In The Shell	Kill or incapacitate 3 enemies with one "Detonate Grenade" quickhack.	Gameplay
1,80%	Rough Landing	While Berserk cyberware is active, perform a Superhero Landing to kill or incapacitate 2 enemies.	Gameplay

Our categories for achievements in Cyberpunk 2077 include story, gameplay, exploration, as well as choice. Choice achievements are for the optional loyalty quests for the ensemble of companion characters available in game as well as 4 achievements for each ending paths.

The achievement with the highest percentage of unlocks is ‘The Fool’ at 90.1%. This achievement is a story achievement. The achievement with the lowest percentage of unlocks is ‘Rough Landing’ at 1.8%. This achievement is a gameplay achievement. Average unlock rate of achievements for Cyberpunk 2077 is 22.96%. When divided, here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 6 story achievements, ranging from 90.1% completion and 33.3% completion with an average of 56.78%. There are a total number of 16 gameplay achievements, ranging from 69.9% completion and 1.8% completion with an average of 21.15%. There are a total number of 12 exploration achievements, ranging from 20.7% completion and 5% completion with an average of 9.03%. There are a total number of 10 choice achievements, ranging from 51.9% completion and 4.4% completion with an average of 22.29%.

The achievement players unlock for finishing the main storyline of the main game is ‘The World’, this story achievement has an unlock rate of 33.3%, 23.48% lower than the average story achievement unlock rate but 10.34% higher than the average achievement unlock rate.

4.10.3 Reviews

We have compiled a list of user reviews for Cyberpunk 2077 from Steam between 22.01.2021 and 20.11.2021. There are a total of 9680 user reviews made between these dates. 6861 of these reviews are tagged positive for recommendation, giving us a percentage of 70.88% positive sentiment towards the game. Table 4.20 shows the list of nodes created and categorized manually.

Table 4.20 : Coded Words From Cyberpunk 2077 Reviews

Codes	Description	References
Choice		2366
Characters		1847
Choices	Story and narrative choices player can make in quests	519
Exploration		6389
Atmosphere	Game area atmosphere	166
City	Night City	1090
Content	Cut content, hard coded content	459
Encounters	Tried to separate “encounter bugs” from game encounters	51
Environment		137
Exploring	Exploring, exploration, how explorable	271
Gigs	Mission variety name	179
Interact	Interaction and interactivity with the world and npcs	203
Jobs	Mission variety name for certain side quests	206
NPCs	Random non-playable characters (dull, beautiful etc.)	520
Quests	Side quests	1143
Streets	Street vendors, walking on the streets	207
World		1757
Gameplay		9018
Builds		425
Cars		841
Clothes	Clothes and clothing which can be looted and equipped.	177
Combat	Combat and combatants	564
Crafting		219
Drive		668
Enemies		373
Experiment	Experimenting with gameplay choices	7
Gameplay		900
Guns	Guns and gunplay	520
Hacking	Hacking mechanics	266
Level	Leveling, Game levels, level up	456
Mechanics		338
Melee	Melee combat	137
Missions	Mission approach and variety	980
Police	Comments about police ai and spawn mechanics	294
Shooting	Shooting feel	280
Skills	Character skills, skill types, skill combos	252
Stealth	Stealth mechanics	221
System	Game systems, gameplay systems	426
Vehicles	Vehicle driving mechanics and variety	260
Weapons		414
Story		6163
Acting	Voice and character acting	180
Acts	Story acts (chapters)	72
Dialogue		259
Johnny Silverhand	Both Johnny and Silverhand words have been crawled.	378
Keanu Reeves	Voice actor for Johnny Silverhand, both words searched.	331
Moments	Story moments	260
Playthrough	Future playthroroughs, multiple playthroughs, playthrough story	248
Scenes	Cutscenes	147
Story		3770
Storyline	Storyline and storylines	224
Writing		294

We have extracted a total of 48 words from our review analysis of Cyberpunk 2077. From 4 categories, 11 words were for Story, 22 for Gameplay, 13 for Exploration, and 2 for Choice.

The combined number of uses for words related to story total 6163, meaning they make 25.75% of the review words. The combined number of uses for words related to gameplay total 9018, meaning they make 37.68% of the review words. The combined number of uses for words related to exploration total 6389, meaning they make 26.69% of the review words. The combined number of uses for words related to choice total 2366, meaning they make 9.88% of the review words.

4.11 Case: Dragon Age Inquisition

4.11.1 Description

Dragon Age Inquisition is an action role-playing game developed by BioWare which was published by Electronic Arts on November 18, 2014. It is the third installment in the Dragon Age franchise. In Dragon Age Inquisition the player controls the Inquisitor on their journey to solve the civil unrest of continent of Thedas and close the Breach, an ominous tear in the sky. The player can navigate the lands of Thedas, completing missions and quests, collecting items and equipment and earning experience points throughout the game loop. Non-Playable characters can be recruited as agents, controllable in combat encounters as members of the player's party. The player can choose dialogue options which impact the relationship between players and NPCs as well as change the story resolutions through their decisions. Dragon Age Inquisition sits at a 72.81% and a 'Mostly Positive' review score on Steam.

4.11.2 Achievements

There are a total of 69 achievements in Dragon Age Inquisition. 50 of these achievements have been a part of the game since its initial release, while 4 have been released with Jaws of Hakkon, 4 with The Descent, and 11 with Trespasser expansions. List of achievements with their Steam unlock percentages can be found in Table 4.21.

Table 4.21 : Achievements of Dragon Age Inquisition Categorized

%	Name	Description	Category
61,00%	The Wrath of Heaven	Finish the prologue.	Story
56,20%	Synergized	Trigger a cross-class combo with a character you control in single-player mode.	Gameplay
50,40%	Skilled	Upgrade any ability once in single-player mode.	Gameplay
46,10%	Trailblazer	Discover a campsite and establish an Inquisition camp in any wilderness area.	Exploration
40,90%	Sharp-Eyed	Find and recover a shard identified by an ocularum.	Exploration
38,80%	Commander	Complete a timed mission on the war table.	Exploration
37,10%	Cavalier	Secure a mount.	Gameplay
36,60%	Customized	Enchant or upgrade a piece of equipment in single-player mode.	Gameplay
36,60%	Well-Prepared	Craft a weapon or piece of armor in single-player mode.	Gameplay
34,80%	Speak Only the Word	Gain access to a major city for the Inquisition.	Story
33,60%	They Who Stand	Recruit a new companion.	Story
33,30%	Well-Read	Discover a veilfire rune.	Exploration
29,10%	Hard Hitter	Land a single blow in excess of 1,000 damage in single-player mode.	Gameplay
27,00%	Opposition in All Things	Close the Breach.	Story
26,80%	In Your Heart Shall Burn	Survive an attack on the Inquisition.	Story
25,80%	Focused	Spend 10 points in a single ability tree with any one single-player character.	Gameplay
24,00%	Loremaster	Collect 250 codex entries in a single playthrough.	Exploration
21,40%	The Brightest of Their Age	Recruit all possible companions in a single playthrough.	Story
19,90%	Wyrmslayer	Kill a high dragon in single-player mode.	Gameplay
19,20%	High Commander	Complete 50 missions or operations in a single playthrough.	Exploration
19,20%	Saddled Up	Purchase or secure five different mounts of any kind.	Exploration
18,20%	Peerless	Level up the Inquisition to rank 10.	Gameplay
17,40%	Specialized	Choose a specialization class.	Gameplay
17,00%	Well-Funded	Earn 50,000 or more gold across all single-player playthroughs.	Gameplay
17,00%	Wicked Eyes and Wicked Hearts	Make an impression on the Orlesian court.	Story
16,70%	Here Lies the Abyss	Face your fears in the Fade.	Story
15,90%	Veteran	Reach level 20 in single-player mode.	Gameplay
14,90%	Giant Slayer	Defeat an ogre alpha.	Story
14,90%	Invincible	Defeat 2,500 enemies in single-player mode.	Gameplay
13,40%	Deep Roads Commander	Complete a mission at the expedition table in the Legion of the Dead camp.	Exploration
12,90%	Pathfinder	Discover a campsite and establish at least one Inquisition camp in 10 wilderness areas.	Exploration
12,50%	What Pride Had Wrought	Reach an ancient ruin before your enemies.	Story
12,20%	Persuasive	Acquire 10 Inquisition agents in a single playthrough.	Gameplay
12,00%	Beloved and Precious	Commit to a romantic relationship.	Exploration
11,90%	Liberator	Liberate three keeps in a single playthrough.	Gameplay
11,70%	People Person	Become friends with at least three of your inner circle in one playthrough.	Exploration
11,40%	Doom upon All the World	End the threat once and for all.	Story
11,30%	Demonslayer	Defeat 1,000 demons in single-player mode.	Gameplay

Table 4.21 (continued) : Achievements of Dragon Age Inquisition Categorized

%	Name	Description	Category
10,40%	Quartermaster	Complete 20 requisition requests in a single playthrough.	Exploration
10,20%	Fact Finder	Help Shaper Valta discover secret dwarven history.	Story
9,90%	Master Builder	Craft an item from Tier 4 materials in all non-masterwork slots in single-player mode.	Gameplay
9,60%	Decorator	Purchase any new decoration element for Skyhold.	Exploration
9,60%	Shaper of Stone	End the earthquakes threatening the surface.	Story
9,10%	Belle of the Ball	Gain the full approval of the Orlesian court.	Gameplay
8,70%	Regal	Completely upgrade one throne.	Exploration
8,60%	Marked for Greatness	Seal 75 rifts in a single playthrough.	Exploration
7,30%	Historian	Uncover the secrets of a legendary figure.	Story
7,10%	Stargazer	Unlock 15 astrariums in a single playthrough.	Exploration
7,10%	Winter's End	Dispel a myth of ancient days.	Story
7,00%	Dragons' Bane	Slay 10 high dragons in single-player mode.	Exploration
6,60%	Forever Marked	Progress the story to unlock.	Story
5,90%	Legend-Marked	Impress the Avvar of Stone-Bear Hold and gain their friendship.	Exploration
5,80%	On Burning Wings	Recruit a powerful ally to even the score.	Story
4,80%	Keymaster	Enter the heart of the Solasan temple.	Exploration
4,70%	Trial of the Emperor	Defeat 20 foes promoted by Walk Softly.	Gameplay
3,90%	Master Alchemist	Upgrade your alchemic potions, grenades, or tonics 30 times in a single playthrough.	Gameplay
2,90%	Coroner	Find all of the wearable items that make up the Taken Shape.	Exploration
2,40%	Botanist	Harvest 50 herbs from Skyhold's garden in a single playthrough.	Exploration
2,30%	Herald	Finish the single-player campaign on at least Hard without lowering the difficulty.	Gameplay
1,80%	Firestarter	Destroy all the Winter Shards and light all the fires in the Old Temple.	Exploration
1,70%	Trial of the Empress	Even Ground on: slay a level 16 or higher Fereldan Frostback.	Gameplay
1,60%	Trial of Temperance	Rest Easy trial always on in Emprise du Lion: claim Suledin Keep.	Gameplay
1,40%	Inquisitor	Finish the single-player campaign on Nightmare without lowering the difficulty.	Gameplay
1,30%	Lateral Thinker	Unlock all caches watched over by ancient statues.	Exploration
1,30%	Trial of the Magician	Travel Light on for "In Hushed Whispers": finish the quest.	Gameplay
1,10%	Trial of the Tower	Rub Some Dirt on It on: slay the Hivernal high dragon.	Gameplay
1,00%	Trial of the Fool	Take It Slow on: reach Skyhold at level 5 or less.	Gameplay
1,00%	Trial of the Hermit	Slay 10 great bears promoted by Grizzly End.	Gameplay
1,00%	Trial of the Lovers	Fair-Weather Friends always on: enter Halamshiral with all followers.	Gameplay

Our categories for achievements in Dragon Age Inquisition include story, gameplay, exploration. The achievement with the highest percentage of unlocks is ‘The Wrath of Heaven’ at 61%. This achievement is a story achievement. The achievements with the lowest percentage of unlocks is ‘Trial of the Lovers’, ‘Trial of the Lovers’, and ‘Trial of the Lovers’, all at 1%. These achievements are all gameplay achievements. Average unlock rate of achievements for Dragon Age Inquisition is 16.18%. When divided,

here are the total number of achievements based on the categories we have defined earlier:

There are a total number of 18 story achievements, ranging from 61% completion and 5.8% completion with an average of 18.65%. There are a total number of 29 gameplay achievements, ranging from 56.2% completion and 1% completion with an average of 15.53%. There are a total number of 22 exploration achievements, ranging from 46.1% completion and 1.3% completion with an average of 15%.

The achievement players unlock for finishing the main storyline of the main game is ‘Doom upon All the World’, this story achievement has an unlock rate of 11.4%, 7.25% lower than the average story achievement unlock rate and 4.78% lower than the average achievement unlock rate.

4.11.3 Reviews

We have compiled a list of user reviews for Dragon Age Inquisition from Steam between 04.06.2020 and 12.09.2021. There are a total of 3090 user reviews made between these dates. 2296 of these reviews are tagged positive for recommendation, giving us a percentage of 74.30% positive sentiment towards the game. Table 4.22 shows the list of nodes created and categorized manually.

Table 4.22 : Coded Words From Dragon Age Inquisition Reviews

Codes	Description	References
Exploration		3693
Areas		194
Collecting		127
Companions		257
Environments		52
Exploration		204
Fetch		91
Immersive		81
Interactions		113
Locations		90
Lore		162
Map		213
Missions		128
Open		323
Optional		23
Places		111
Quests		633
Romance		127
Travel		51
War Table		57
World		605
Zones		51

Table 4.22 (continued) : Coded Words From Dragon Age Inquisition Reviews

Codes	Description	References
Gameplay		4121
Abilities		141
Armor		60
Attack		93
Battle		78
Classes		118
Combat		581
Crafting		152
Damage		51
Depth		43
Difficulty		101
Dragons		51
Enemies		174
Fights		204
Gameplay		272
Grind		94
Items		135
Kill		104
Level		178
Loot		96
Mage		94
Mechanics		100
Modding		193
Party		208
Potions		54
Power		74
Skills		145
Systems		194
Tactics		196
Walking		64
Weapons		73
Story		3722
Acting		71
Characters		1032
Choices		256
Continuation		77
Cutscenes		75
Decisions		110
Dialogue		134
Ending		235
Moments		68
NPCs		53
Options		169
Pace		44
Plot		92
Progression		72
Story		1169
Storyline		65

We have extracted a total of 67 words from our review analysis of Dragon Age Inquisition. From 3 categories, 16 words were for Story, 30 for Gameplay, and 21 for Exploration.

The combined number of uses for words related to story total 3722, meaning they make 32.26% of the review words. The combined number of uses for words related to

gameplay total 4121, meaning they make 35.72% of the review words. The combined number of uses for words related to exploration total 3693, meaning they make 32.01% of the review words.

4.12 Game Comparison

Here is an overview of our game percentages which can be seen in table 4.23.

Table 4.23 : Overview of game review and achievement data

Game	Story %	Gameplay %	Exploration %	Story %	Gameplay %	Exploration %	Like %	Label
	Achievements			Reviews				
The Witcher 3: Wild Hunt	28.08	15.03	18.35	38.94	24.90	28.03	96.55	90+
The Elder Scrolls V: Skyrim	18.43	14.38	15.12	21.68	33.90	37.05	95.10	90+
Assassin's Creed Origins	39.40	25.15	19.66	27.67	37.52	33.94	87.29	80-90
Assassin's Creed Odyssey	37.93	35.11	18.91	32.82	47.96	35.46	90.24	90+
Mass Effect 3	28.04	24.95	20.83	53.12	35.75	11.12	73.20	70-80
Mass Effect Andromeda	42.28	11.77	15.57	36.32	31.23	32.46	77.59	70-80
Mass Effect Legendary	40.89	22.32	35.66	41.46	25.25	33.29	94.45	90+
Deus Ex: Human Revolution	22.44	30.56	46.20	27.88	50.06	16.06	92.36	90+
Deus Ex: Mankind Divided	12.18	20.45	14.15	34.40	34.45	25.85	82.19	80-90
Cyberpunk 2077	56.78	21.15	9.03	25.75	37.68	26.69	70.88	70-80
Dragon Age Inquisition	18.65	15.53	15.00	32.26	35.72	32.01	74.30	70-80

Review word count rates and achievement completion rates of our games are visualized in Figure 4.1.

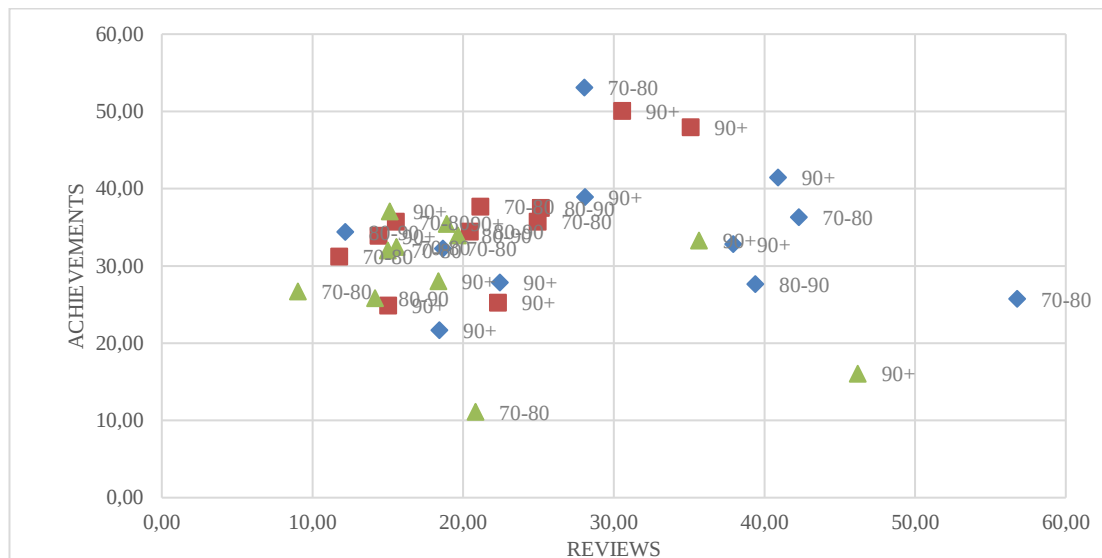


Figure 4.1 : Achievement and Review Percentage Visualization

The games we have analyzed will then be put in a simple classification algorithm. K-nearest-neighbor algorithm allows us to create clusters of games. These clusters are then labeled with game review recommendation rates, grouped in three as '70-80', '80-90' and '90+'. Separated between the three main categories, story, gameplay, exploration each feature and later using all 6 features for a main classification. For each player engagement aspect category euclidian distance of a new input sample is calculated (4.1) where $x_{i,1}$ is achievement completion average of an aspect and $x_{i,2}$ is the percentage of usage of aspect related words in reviews.

$$d(x_i, x_1) = \sqrt{(x_{i,1} - x_{1,1})^2 + (x_{i,2} - x_{1,2})^2} \quad (4.1)$$

The new game then can be placed in the cluster of the nearest neighbor in $k = 1$. The same equation is then applied to all three aspects at the same time. As seen in the equation, where x_i is the input sample with 6 features, while x_1 is the new entry which we will be searching the nearest neighbor for (4.2).

$$d(x_i, x_1) = \sqrt{\sum_{j=1}^6 (x_{i,j} - x_{1,j})^2} \quad (4.2)$$

5. DISCUSSION

How developers define and spread their game's achievement categories can be used to understand which aspects of their games they want to highlight as well as how successful they have been in the design and implementation of their game using the completion rates of these achievements.

Throughout this research we've defined what player engagement is, what impacts player engagement and how we can measure it. Using this previous research, we asked if we could create and indicate any causation or correlation between two ways of measuring player engagement, those being user reviews and game achievements.

We have asked two research questions, these being whether we could create a correlation between user reviews and steam achievements and whether this supposed correlation could be tied to the player engagement aspects which we labeled story, gameplay, and exploration.

Length of games was one of the main aspects impacting achievement completion rates as well as positive recommendations regarding user reviews. If an achievement required players to have spent more hours on a game, that achievement would have lower completion rates. At the same time, players who played for longer hours gave more positive reviews compared to those playing less hours than them.

In order to analyze player engagement, we have taken the combined results of our review and achievement categorizations from western action role playing games created in the last 11 years.

We will start our discussion with game achievements. The number of achievements available doesn't seem to have any impact on achievement completion rates based on categories. In almost all of our categorizations we see story achievements to have the highest average of unlocks. Just looking at this data we could conclude that story of games in the ARPG genre generates more engagement than our other categories. But we need to compare these findings with our review analysis.

Looking through our review analysis, we see our main category words (story, gameplay, exploration) used the most in most instances, reinforcing our categorization choice. Other notable mentions concerning words used by reviewers include ‘quest’, ‘character’, and ‘combat’. Leading characters of the main storylines of these type of games also get mentioned more than most words.

Our first look of analysis will be regarding our oldest game on the list, The Elder Scrolls V: Skyrim. Achievement rates of Skyrim give us meddling results as there is no more than 4% difference between achievement rates in our main categories. Reviews give a better insight into what players find engaging in Skyrim, as story mentions are almost doubled by exploration with gameplay not so far behind. The main focus of players in regards to reviews for Skyrim are ‘quests’, ‘the world’, and ‘characters’, suggesting these factors to have the most impact on player engagement.

The two Deus Ex games on our list were the only games which story achievement average wasn’t the leading rate as Deus Ex: Human Revolution had exploration and Deus Ex: Mankind Divided had gameplay as the leading achievement average. Both games’ story achievement unlock averages were the lowest of the three categories. For Deus Ex: Human Revolution, this could be a result of the game having multiple endings with achievements, impacting the story achievement unlock rates. In respect to user reviews, Deus Ex: Human Revolution had the widest range of unique words used for gameplay, giving us an insight into how important the gameplay aspect of Deus Ex is for player engagement. This is also contrasted with Deus Ex: Mankind Divided, where there are almost as many instances for story words as there are for gameplay. This contrasted with story achievement rates suggests a negative sentiment towards the story of Deus Ex: Mankind Divided regarding player engagement. The biggest impact on this seems to be the low number of achievements regarding the game story, suggesting the length of the main story to have an impact on the player engagement in this aspect.

The two Assassin’s Creed games on our list have higher story achievement unlocks with similar overall achievement unlock rates. However, Assassin’s Creed Odyssey gameplay achievement average is much more closer to the story achievement average in contrast to Assassin’s Creed Origins. For both Assassin’s Creed titles, the amount of words used in the player reviews for the category exploration does not reflect the same amount of interest in the achievement rates for exploration, showing a negative

sentiment regarding the encountered events and map size of the open-world. We can ascertain from these findings that players do not find the open-world aspects of Assassin's Creed games engaging enough.

In all three Mass Effect games, story achievements were the highest rated on average. This data is then reinforced with user reviews where the same trend continued, proving story's importance on player engagement in BioWare's Mass Effect franchise. However, Mass Effect 3's high user review rate for story words in contrast to lower average story achievements to the other Mass Effect games suggests a negative sentiment from users. This sentiment is also reflected in the recommendation rates of Mass Effect 3 with 73.20%. Unlike the main trilogy games of Mass Effect, Mass Effect Andromeda seems to have the lowest amount of engagement which can be seen from the lowest percentage of gameplay achievements completed on average by users. The conversation topics of story, gameplay, and exploration are evenly distributed for Andromeda, however the achievement data skews towards the story, leading to our understanding that players don't want to engage with the game outside of the main story. For the Mass Effect Legendary Edition, the gameplay achievement and review word usage rates are positively correlated with each other. Since this game is a remaster of three older titles with very little gameplay updates, the lack of focus from the player towards this aspect of the game is understandable. When the review data is contrasted with achievement rates however, we see that a remaster of older games don't engage the player in the gameplay aspect as much as story or exploration.

Contrasting analysis done with Mass Effect franchise with BioWare's other game series with Dragon Age Inquisition show similar results with the one exception being a lower focus on story and increased focus on gameplay from the user reviews. The depth of gameplay mechanics for Dragon Age Inquisition can be seen by looking at the number of review words for gameplay is created. However, this is negatively contrasted in the exploration aspect of Dragon Age Inquisition as an average rate of word usage in reviews is reflected in lowest percentage of achievements unlocked by players in game, presenting us with a negative sentiment regarding quests and the world, two most used words in the exploration category.

The results for CD Projekt Red's two main titles, The Witcher 3: Wild Hunt and Cyberpunk 2077 show us the power of story in player engagement as both games story achievements double the other two categories of achievements. For Cyberpunk 2077,

story achievement average might've been lower (and similar to other games we've covered in this genre) if choice achievements were combined with the story achievements. These achievements although relate to the main story of the game, they are impacted by the choices the player decides to make, separating them from our definition of story as an aspect of engagement. Regarding reviews, Cyberpunk 2077 players are more interested in talking about gameplay elements of the game. And the negative contrast between achievements and reviews in this category present us with a negative sentiment towards this game regarding gameplay. As previously stated in our game description, Cyberpunk 2077 was released in a buggy and unfinished state, with many of the commercialized game mechanics not available in the final release of the game. This might be correlated with the negative sentiment players express towards the gameplay aspects of game engagement in their reviews. A future study might focus on the manual analysis of sentiments in these reviews by removing the focus on the game's undelivered promises and buggy state to understand the actual impact this game has in player engagement.

The Witcher 3: Wild Hunt achievement rates were the starting point of this thesis with our question "Why does everyone say they love Witcher 3's story but only one fourth of players completed the story ending achievement?". Looking at our results, we see story to indeed be the main engaging factor of The Witcher 3: Wild Hunt in both achievements and user reviews. This shows us a positive sentiment towards the story aspect of Witcher 3 which was what we had hypothesized. The amount of character names referenced in player reviews reinforce this sentiment. Gameplay and exploration aspects are not far away in the average achievement and review word usage rates, suggesting a healthy combination of these three aspects creates the most player engagement. This analysis is further enhanced by The Witcher 3: Wild Hunt being the highest recommended game in our list at 96.55%.

Through our comparison of these ARPG games, we have found most of the game achievement averages to be between 20-40% ranges. This puts 'Passed the Trial', achievement for finishing the game in The Witcher 3: Wild Hunt inside this range.

Through our clustering of games for each category based on the k-nearest-neighbor algorithm, we tried to create a formula to find the recommendation rates of other games using achievement and review data. Clustering of games using this method might give us a better understanding of game recommendation rates for individual player

engagement aspects, as well as a way to predict this rate using the combination of these three player engagement aspects together.





6. CONCLUSION

The purpose of the research was to identify a correlation between objective player achievements and subjective player reviews in western action role-playing games for the aspects of game engagement. Based on our case based analysis and overall comparisons it can be concluded that story, gameplay, and exploration aspects of a WRPG can be analyzed using achievement unlock rates and review word counts.

Using the total review score labeling clusters, we have created from our K-Nearest Neighbor clustering we have checked the correlation coefficient of these clusters based on our player engagement categories. For our cluster of games reviewed between the 90 and 100 range (90+) we've found a positive correlation for story ($r = 0.79$) and gameplay ($r = 0.81$) while a negative correlation for exploration ($r = -0.76$). For the games reviewed between 70 and 80 (70-80) we can see negative correlations for story ($r = -0.48$) and exploration ($r = -0.60$) while a positive correlation for gameplay ($r = 0.73$)

When we compare this to the clustering created from our K-Nearest Neighbor clustering without our labeling we can find two separate curves for each category. For story we only see a small positive correlation in curve 1 ($r_1 = 0.28$) and a negative correlation in curve 2 ($r_2 = -0.79$) For gameplay we can see positive correlation in both curves ($r_1 = 0.77$ & $r_2 = 0.90$). For exploration we can see a positive correlation for curve 1 ($r_1 = 0.58$) and a negative correlation for curve 2 ($r_2 = -0.87$)

These results and their comparison further reinforce our conclusion regarding the lack of player engagement for games successful only in engaging the player in the story category while showing the importance successful combination of the story and gameplay aspects in engaging the player in Western action role-playing games.

From this research we have found an exceptional importance of story for player engagement which could be reinforced with correct implementations of gameplay and exploration aspects. All the successful games in our research showed a positive sentiment towards the story aspect of player engagement, while the unsuccessful

games showed a failed attempt at engaging the player using gameplay and exploration. Balance of all three of these aspects seems a key to creating better, more engaging games, while overwhelming the player with just one leads to a less favorable player experience.

Moving forward, manual sentiment analysis of these player reviews seems to be the natural direction towards understanding player engagement and its correct applications. Comparisons of games in the same franchise create the best detailed understanding of player engagement which is a possible research point.



7. FUTURE WORK

Our method of comparing player submitted subjective reviews and player earned objective achievements can lead to a better understanding in topics outside of player engagement. Using our findings we can also review future titles from the developers mentioned in this research in terms of player engagement.

While continuing our research, other games which could be categorized as western action role playing games have been released on Steam with achievements. These games include The Outer Worlds by Obsidian Entertainment and Horizon: Zero Dawn by Guerrilla Games. These games were omitted from our research simply for the reason that they were released on Steam after we had finished our review collection stage. Other games in this category which could be added are as follows: Kingdom Come: Deliverance, Middle Earth: Shadow of Mordor, Middle-Earth: Shadow of War, The Outer Worlds, Fallout: New Vegas, Dragon's Dogma: Dark Arisen, Kingdoms of Amalur: Re-Reckoning, Fallout 4.

User review data we have pulled from Steam's databases gives us more than just recommendation and review itself. Using the helpfulness and funny ratings of reviews we can study which aspects of user reviews other players respond to, as well as reviews with which aspects included provide players the most they need from a user review. Grouping of reviews based on review dates can be used to compare the change in both sentimental approach of reviewers and how post-release updates change the attitudes and aspects of user reviews.



REFERENCES

- [1] **Pontiki, M., Galanis, D., Papageorgiou, H., Androutsopoulos, I., Manandhar, S., Al-Smadi, M., . . . De Clercq, O.** (2016). *Semeval-2016 task 5: Aspect based sentiment analysis*. Paper presented at the International workshop on semantic evaluation.
- [2] **Mäyrä, F., Stenros, J., Paavilainen, J., & Kultima, A.** (2017). From social play to social games and back: The emergence and development of social network games. In *New perspectives on the social aspects of digital gaming* (pp. 11-32): Routledge.
- [3] **Schoenau-Fog, H.** (2011). *The Player Engagement Process-An Exploration of Continuation Desire in Digital Games*. Paper presented at the DiGRA Conference.
- [4] **Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. J. I. j. o. h.-c. s.** (2008). Measuring and defining the experience of immersion in games. 66(9), 641-661.
- [5] **Brown, E., & Cairns, P.** (2004). *A grounded investigation of game immersion*. Paper presented at the CHI'04 extended abstracts on Human factors in computing systems.
- [6] **Rigby, S., & Ryan, R. M.** (2011). *Glued to games: How video games draw us in and hold us spellbound: How video games draw us in and hold us spellbound*: AbC-CLIo.
- [7] **Adams, E.** (2014). *Fundamentals of game design*: Pearson Education.
- [8] **Wiemeyer, J., Nacke, L., Moser, C., & Floyd'Mueller, F.** (2016). Player experience. In *Serious games* (pp. 243-271): Springer.
- [9] **Johnson, D., Gardner, M. J., & Perry, R. J. I. J. o. H.-C. S.** (2018). Validation of two game experience scales: the player experience of need satisfaction (PENS) and game experience questionnaire (GEQ). 118, 38-46.
- [10] **Ryan, R. M., Rigby, C. S., Przybylski, A. J. M., & emotion.** (2006). The motivational pull of video games: A self-determination theory approach. 30(4), 344-360.
- [11] **IJsselsteijn, W. A., de Kort, Y. A., & Poels, K. J. E. T. U. E.** (2013). The game experience questionnaire. 46(1).
- [12] **IJsselsteijn, W., Van Den Hoogen, W., Klimmt, C., De Kort, Y., Lindley, C., Mathiak, K., . . . Vorderer, P.** (2008). *Measuring the experience of digital game enjoyment*. Paper presented at the Proceedings of measuring behavior.
- [13] **Aker, Ç., Inal, Y., & Rızvanoğlu, K.** (2020). A multi-modal approach for evaluating player experience on different gaming platforms. *International Journal of Mobile Communications*, 18(2), 175-195.
- [14] **Bostan, B., & Berkman, M. J. P. o. t. E. G.** (2017). Explorations in Game Experience: A case study of 'Horizon Zero Down'.

- [15] **Wirth, W., Hartmann, T., Böcking, S., Vorderer, P., Klimmt, C., Schramm, H., . . . Gouveia, F. R. J. M. p.** (2007). A process model of the formation of spatial presence experiences. 9(3), 493-525.
- [16] **Csikszentmihalyi, M., & Csikzentmihaly, M.** (1990). *Flow: The psychology of optimal experience* (Vol. 1990): Harper & Row New York.
- [17] **Choi, D., Kim, J. J. C., & behavior.** (2004). Why people continue to play online games: In search of critical design factors to increase customer loyalty to online contents. 7(1), 11-24.
- [18] **Denisova, A., & Cairns, P. J. E. C.** (2019). Player experience and deceptive expectations of difficulty adaptation in digital games. 29, 56-68.
- [19] **Vanhatupa, J.-M.** (2011). *Guidelines for personalizing the player experience in computer role-playing games*. Paper presented at the Proceedings of the 6th International Conference on Foundations of Digital Games.
- [20] **Sawyer, R., Rowe, J., Azevedo, R., & Lester, J.** (2018). *Modeling player engagement with Bayesian hierarchical models*. Paper presented at the Proceedings of the AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment.
- [21] **Brockmyer, J. H., Fox, C. M., Curtiss, K. A., McBroom, E., Burkhart, K. M., & Pidruzny, J. N. J. J. o. e. s. p.** (2009). The development of the Game Engagement Questionnaire: A measure of engagement in video game-playing. 45(4), 624-634.
- [22] **Sullivan, A., Mateas, M., & Wardrip-Fruin, N.** (2010). *Rules of engagement: moving beyond combat-based quests*. Paper presented at the Proceedings of the Intelligent Narrative Technologies III Workshop.
- [23] **Iten, G. H., Steinemann, S. T., & Opwis, K.** (2017). *To save or to sacrifice? Understanding meaningful choices in games*. Paper presented at the Extended abstracts publication of the annual symposium on computer-human interaction in play.
- [24] **Mayes, D. K., & Cotton, J. E.** (2001). *Measuring engagement in video games: A questionnaire*. Paper presented at the Proceedings of the human factors and ergonomics society annual meeting.
- [25] **Medler, B., & Eludamos, J.** (2009). Generations of game analytics, achievements and high scores. *Journal for Computer Game Culture*, 3(2), 177-194.
- [26] **Locke, E. A., & Bryan, J. F.** (1969). Knowledge of score and goal level as determinants of work rate. *Journal of Applied Psychology*, 53(1p1), 59.
- [27] **Rothkopf, E. Z., & Billington, M. J.** (1979). Goal-guided learning from text: inferring a descriptive processing model from inspection times and eye movements. *Journal of educational psychology*, 71(3), 310.
- [28] BioWare. (2006). *Mass Effect* [Video Game]. Edmonton, Alberta, Canada: Electronic Arts.
- [29] **Blair, L.** (2011). The use of video game achievements to enhance player performance, self-efficacy, and motivation.
- [30] **de Salas, K., & Lewis, I.** (2013). *Identifying types of Achievements*. Paper presented at the Proceedings of CGAMES'2013 USA.
- [31] **Montola, M., Nummenmaa, T., Lucero, A., Boberg, M., & Korhonen, H.** (2009). *Applying game achievement systems to enhance user experience in a photo sharing service*. Paper presented at the Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era.

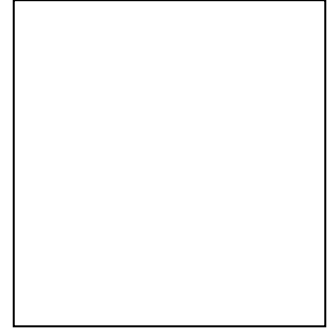
- [32] **Groening, C., & Binnewies, C. J. C. i. H. B.** (2019). "Achievement unlocked!"-The impact of digital achievements as a gamification element on motivation and performance. 97, 151-166.
- [33] **Hamari, J., Koivisto, J., & Sarsa, H.** (2014). *Does gamification work?--a literature review of empirical studies on gamification*. Paper presented at the 2014 47th Hawaii international conference on system sciences.
- [34] **Johnson, D., Klarkowski, M., Vella, K., Phillips, C., McEwan, M., & Watling, C. N. J. C. i. H. B.** (2018). Greater rewards in videogames lead to more presence, enjoyment and effort. 87, 66-74.
- [35] **Park, K., Cha, M., Kwak, H., & Chen, K.-T.** (2017). *Achievement and friends: key factors of player retention vary across player levels in online multiplayer games*. Paper presented at the Proceedings of the 26th international conference on world wide web companion.
- [36] **Sherrick, B., & Schmierbach, M. J. T. C. G. J.** (2016). The effects of evaluative reviews on market success in the video game industry. 5(3), 185-194.
- [37] **Zhu, F., & Zhang, X. J. J. o. m.** (2010). Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics. 74(2), 133-148.
- [38] **Borman, M.** (2018). 'No Man's Sky': The Greatest Redemption in Gaming History Retrieved from <http://ndsuspectrum.com/no-mans-sky-the-greatest-redemption-in-gaming-history/>
- [39] **McAloon, A.** (2021). CDPR refunded 30,000 copies of Cyberpunk 2077 in \$2.2m refund campaign. Retrieved from <https://www.gamedeveloper.com/business/cdpr-refunded-30-000-copies-of-cyberpunk-2077-i-in-2-2m-refund-campaign>
- [40] **Jonsson, M.** (2020). Cyberpunk 2077 or The Problem That Is the AAA Industry. Retrieved from <https://www.gamedeveloper.com/disciplines/cyberpunk-2077-or-the-problem-that-is-the-aaa-industry>
- [41] **Stafford, P.** (2016). Brain wave: The PhDs changing games. Retrieved from <http://www.polygon.com/features/2016/1/18/9882430/brain-wave-the-phds-changing-games>
- [42] **Zagal, J. P., Ladd, A., & Johnson, T.** (2009). *Characterizing and understanding game reviews*. Paper presented at the Proceedings of the 4th international Conference on Foundations of Digital Games.
- [43] **Santos, T., Lemmerich, F., Strohmaier, M., & Helic, D. J. P. o. t. A. o. h.-c. i.** (2019). What's in a Review: Discrepancies Between Expert and Amateur Reviews of Video Games on Metacritic. 3(CSCW), 1-22.
- [44] **Graft, K. J. W. W. W. e. p.** (2009). Stardock reveals impulse, steam market share estimates. 11.
- [45] **Eberhard, L., Kasper, P., Koncar, P., & Gütl, C.** (2018). *Investigating helpfulness of video game reviews on the steam platform*. Paper presented at the 2018 Fifth International Conference on Social Networks Analysis, Management and Security (SNAMS).
- [46] **Bais, R., Odek, P., & Ou, S.** (2017). Sentiment Classification on Steam Reviews. In: Stanford University.
- [47] **Lin, D., Bezemer, C.-P., Zou, Y., & Hassan, A. E. J. E. S. E.** (2019). An empirical study of game reviews on the Steam platform. 24(1), 170-207.

- [48] **Johnson, D., Watling, C., Gardner, J., & Nacke, L. E.** (2014). *The edge of glory: the relationship between metacritic scores and player experience*. Paper presented at the Proceedings of the first ACM SIGCHI annual symposium on Computer-human interaction in play.
- [49] **Livingston, I. J., Nacke, L. E., & Mandryk, R. L.** (2011). *The impact of negative game reviews and user comments on player experience*. Paper presented at the Proceedings of the 2011 ACM SIGGRAPH Symposium on Video Games.
- [50] **Strååt, B., & Verhagen, H.** (2017). *Using User Created Game Reviews for Sentiment Analysis: A Method for Researching User Attitudes*. Paper presented at the GHITALY@ CHIItaly.
- [51] **Strååt, B., Verhagen, H., & Warpefelt, H.** (2017). *Probing user opinions in an indirect way: an aspect based sentiment analysis of game reviews*. Paper presented at the Proceedings of the 21st International Academic Mindtrek Conference.
- [52] **Donovan, T.** (2010). *Replay: The history of video games*: Yellow Ant.
- [53] **Liu, B.** (2011). *Web data mining: exploring hyperlinks, contents, and usage data* (Vol. 1): Springer.
- [54] **Barton, M., & Stacks, S.** (2019). *Dungeons and desktops: The history of computer role-playing games 2e*: CRC Press.
- [55] **Van Der Heijden, M., Bakkes, S., & Spronck, P.** (2008). *Dynamic formations in real-time strategy games*. Paper presented at the 2008 IEEE Symposium On Computational Intelligence and Games.
- [56] **Bostan, B. J. C. i. E.** (2009). Player motivations: A psychological perspective. 7(2), 1-26.
- [57] **Van Ommen, M. J. J. o. G., & Worlds, V.** (2018). Emergent affect in Final Fantasy VII and Japanese role-playing games. 10(1), 21-39.
- [58] **RED, C. P.** (2015). *The Witcher 3: Wild Hunt* (Version Game of the Year) [Video Game]. Steam: CD Projekt RED. Retrieved from https://store.steampowered.com/app/292030/The_Witcher_3_Wild_Hunt/
- [59] **Studios, B. G.** (2011). *The Elder Scrolls V: Skyrim* (Version Legendary Edition) [Video Game]. Steam: Bethesda Softworks. Retrieved from https://store.steampowered.com/app/72850/The_Elder_Scrolls_V_Skyrim/
- [60] **Montreal, U.** (2017). *Assassin's Creed Origins* [Video Game]. Steam: Ubisoft. Retrieved from https://store.steampowered.com/app/582160/Assassins_Creed_Origins/
- [61] **Quebec, U.** (2018). *Assassin's Creed Odyssey* [Video Game]. Steam: Ubisoft. Retrieved from https://store.steampowered.com/app/812140/Assassins_Creed_Odyssey/
- [62] **BioWare.** (2012). *Mass Effect 3* (Version N7 Digital Deluxe Edition) [Video Game]. Steam: Electronic Arts. Retrieved from https://store.steampowered.com/app/1238020/Mass_Effect_3_N7_Digital_De_luxe_Edition_2012/
- [63] **BioWare.** (2017). *Mass Effect Andromeda* (Version Deluxe Edition) [Video Game]. Steam: Electronic Arts. Retrieved from https://store.steampowered.com/app/1238000/Mass_Effect_Andromeda_Delu_xe_Edition/
- [64] **BioWare.** (2021). *Mass Effect Legendary Edition* [Video Game]. Steam: Electronic Arts. Retrieved from

- https://store.steampowered.com/app/1328670/Mass_Effect_Legendary_Edition/
- [65] **Montreal, E.** (2013). Deus Ex: Human Revolution (Version Director's Cut) [Video Game]. Steam: Square Enix. Retrieved from https://store.steampowered.com/app/238010/Deus_Ex_Human_Revolution_Directors_Cut/
 - [66] **Montreal, E.** (2016). Deus Ex: Mankind Divided [Video Game]. Steam: Square Enix. Retrieved from https://store.steampowered.com/app/337000/Deus_Ex_Mankind_Divided/
 - [67] **RED, C. P.** (2020). Cyberpunk 2077 [Video Game]. Steam: CD Projekt RED. Retrieved from https://store.steampowered.com/app/1091500/Cyberpunk_2077/
 - [68] **BioWare.** (2014). Dragon Age Inquisition [Video Game]. Steam: Electronic Arts. Retrieved from https://store.steampowered.com/app/1222690/Dragon_Age_Inquisition/
 - [69] **Alessia, D., Ferri, F., Grifoni, P., & Guzzo, T.** (2015). Approaches, tools and applications for sentiment analysis implementation. *International Journal of Computer Applications*, 125(3).
 - [70] **Serrano-Guerrero, J., Olivas, J. A., Romero, F. P., & Herrera-Viedma, E. J. I. S.** (2015). Sentiment analysis: A review and comparative analysis of web services. 311, 18-38.
 - [71] **Nasukawa, T., & Yi, J.** (2003). *Sentiment analysis: Capturing favorability using natural language processing*. Paper presented at the Proceedings of the 2nd international conference on Knowledge capture.
 - [72] **Morinaga, S., Yamanishi, K., Tateishi, K., & Fukushima, T.** (2002). *Mining product reputations on the web*. Paper presented at the Proceedings of the eighth ACM SIGKDD international conference on Knowledge discovery and data mining.
 - [73] **Pang, B., Lee, L., & Vaithyanathan, S. J. a. p. c.** (2002). Thumbs up? Sentiment classification using machine learning techniques.
 - [74] **Tong, R. M.** (2001). *An operational system for detecting and tracking opinions in on-line discussion*. Paper presented at the Working Notes of the ACM SIGIR 2001 Workshop on Operational Text Classification.
 - [75] **Turney, P. D. J. a. p. c.** (2002). Thumbs up or thumbs down? Semantic orientation applied to unsupervised classification of reviews.
 - [76] **Pang, B., & Lee, L. J. C. L.** (2009). Opinion mining and sentiment analysis. 35(2), 311-312.
 - [77] **Liu, B. J. H. o. n. l. p.** (2010). Sentiment analysis and subjectivity. 2(2010), 627-666.
 - [78] **Medhat, W., Hassan, A., & Korashy, H. J. A. S. e. j.** (2014). Sentiment analysis algorithms and applications: A survey. 5(4), 1093-1113.
 - [79] **Tausczik, Y. R., Pennebaker, J. W. J. J. o. l., & psychology, s.** (2010). The psychological meaning of words: LIWC and computerized text analysis methods. 29(1), 24-54.
 - [80] **Ye, Q., Zhang, Z., & Law, R. J. E. s. w. a.** (2009). Sentiment classification of online reviews to travel destinations by supervised machine learning approaches. 36(3), 6527-6535.
 - [81] **Saleh, M. R., Martín-Valdivia, M. T., Montejo-Ráez, A., & Ureña-López, L. J. E. S. w. A.** (2011). Experiments with SVM to classify opinions in different domains. 38(12), 14799-14804.

- [82] **Montejo-Ráez, A., Martínez-Cámara, E., Martín-Valdivia, M. T., Ureña-López, L. A. J. C. S., & Language.** (2014). Ranked wordnet graph for sentiment polarity classification in twitter. *28*(1), 93-107.
- [83] **Coştu, S., Aydın, S., Filiz, M. J. P.-S., & Sciences, B.** (2009). Students' conceptions about browser-game-based learning in mathematics education: TTNNetvitamin case. *1*(1), 1848-1852.
- [84] **Islam, M. R.** (2014). *Numeric rating of Apps on Google Play Store by sentiment analysis on user reviews*. Paper presented at the 2014 International Conference on Electrical Engineering and Information & Communication Technology.
- [85] **Barr, M. J. C. i. h. b.** (2018). Student attitudes to games-based skills development: Learning from video games in higher education. *80*, 283-294.
- [86] **Coknaz, D., Mirzeoglu, A. D., Atasoy, H. I., Alkoy, S., Coknaz, H., & Goral, K. J. E. j. o. p.** (2019). A digital movement in the world of inactive children: favourable outcomes of playing active video games in a pilot randomized trial. *178*(10), 1567-1576.
- [87] **Miles, M. B., & Huberman, A. M.** (1994). *Qualitative data analysis: An expanded sourcebook*: sage.
- [88] **Klimmt, C.** (2003). *Dimensions and determinants of the enjoyment of playing digital games: A three-level model*. Paper presented at the Level up: Digital games research conference.
- [89] **Esuli, A., Pucheta, R. S., & Zhao, Z.** (2018). STEAM crawler. Retrieved from <https://github.com/aesuli/steam-crawler>
- [90] **Peterson, L. E. J. S.** (2009). K-nearest neighbor. *4*(2), 1883.

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