"I Used to Be an Adventurer Like You": Fear of Missing Out in The Elder Scrolls Online

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ABSTRACT

We analyze players' reception of collectible mechanics as part of gameplay and their associated fear or missing out in a massively multiplayer role-playing game, The Elder Scrolls Online, based on online discussion of the game on its official forums, and focusing on a notable period of time where a special anniversary jubilee event was held, and unique rare collectibles were made temporarily available. Using machine learning methods of topic modeling we reveal the prominent and rising themes during the collection period and analyze their implications for gamified collectibles and their reception.

Keywords

Topic Modeling, Latent Dirichlet Allocation, Multiplayer Gaming, Fear of Missing Out, Collectibles

INTRODUCTION

The Elder Scrolls Online (ESO) is a fantasy massively multiplayer online role-playing game (MMORPG) published by Zenimax Online Studios (ZOS). The game is set in Tamriel, the world where the popular single-player Elder Scrolls role-playing games take place and builds on their lore. We analyze online discussion on ESO and next describe aspects of the game that help understand the findings.

In ESO, the central empire of Tamriel has collapsed and three factions (Daggerfall Covenant, Ebonheart Pact, and Aldmeri Dominion) are warring for power while the demonic prince Molag Bal tries to seize control of the world. Players play as heroes of one of the factions, completing story quests and participating in collaborative group activities (including dungeons, trials, and events) and player-versus-player (PVP) content (including duels, "battlegrounds" team matches, and faction warfare and resource capture in a dedicated area of the game world). ESO was launched in April 2014, and in 2024 ESO celebrated its 10th anniversary with events including a jubilee celebration in April 2024.

ESO is a paid game where the initial purchase grants access to many in-game zones, and additional zones can be purchased as downloadable content (DLC). The game does not require a monthly subscription but subscribing to its "ESO Plus" service grants quality-of-life gameplay benefits and access to additional small zones. At the time of writing, ESO has had an overall player base of around 22-24 million accounts and a recent average daily active player population of around 19-26 thousand players[1].

ESO features numerous collectible elements. Firstly, gameplay is greatly affected by collection of equipment "sets" with in-game bonuses suitable for different character builds. Secondly, a variety of furniture exists that can be positioned in player housing; the game recently added a "Home Tours" feature to showcase players' housing creations. Thirdly, the game features a variety of cosmetic options, particularly "crafting styles" that let players create weapon and armor pieces with specific looks; the pieces can be combined at will and can be further colored with "dyes". Players can display different collectible pets and mounts with their character and can collect special animations (emotes and "personalities") for their character. As a result, a huge range of looks can be created for player characters. Some players have even called fashion and furnishing the true "endgame" content of ESO. Thus, collecting the latter categories of cosmetic items can become important personal goals and focuses of players' time use. Collectibles have also been a subject of research, for example Toups Dugas et al. (2016) found that rarity and uniqueness were aspects that contributed to their value.

Players start with limited options for sets, fashion, and furnishing. During gameplay players can gain options by learning to craft them, by finding items through in-game loot, or purchasing them for in-game currencies. However, not all cosmetic items can be acquired in-game and further options for housing, furniture, and cosmetics are purchasable in ESO's "Crown Store" for a virtual currency "crowns", which cannot be earned in-game and can only be bought for real money or acquired slowly over an ESO Plus subscription. However, some special furniture plans and crafting styles can be found rarely as reward "drops" from in-game activities.

Due to the strong presence of collecting, and frequent limited availability of collectibles, we wished to analyze players' reception of collectible elements in ESO, their attitudes and motivations towards the collecting behavior, and their fear of missing out on valued collectibles. Our research questions are:

RQ1 What are the prominent themes of discussion of players regarding the systems of collectible gathering in ESO? Does fear of missing out play a major role, and how do players react to their limited availability?

RQ2 How do themes of discussion regarding ESO vary over time, what themes are enduring and what are momentary or recurring?

We study these questions following a big data approach, by gathering a large corpus of players' discussions from a major discussion forum of ESO and analyzing it by a combination of machine learning based topic modeling and human read-through of prominent example documents.

In the following, we give an overview of previous academic research about ESO and the concept of fear of missing out (FoMO) in relation to social media and MMORPGs. We explain how we obtained the document corpus and describe the latent Dirichlet allocation (LDA) topic modeling method and the process of selecting the final model.

We then describe the resulting topics, discuss their implications in relation with the FoMO concept, and draw conclusions.

BACKGROUND

Previous Studies on ESO

ESO has existed since 2014 and has been the topic of some academic works. Guilds, which among other functions play a role in the exchange of collectibles, have been investigated by traditional surveys and ethnographic observations. For instance, Pulliam (2018) studied the correlation between the social support and players' guild membership for three MMORPGs including ESO based on a survey with 2914 responses of which 338 satisfied quality controls. Poor (2019) studied large guilds of over 400 members and got answers from 5 guild leaders about their strategies to maintain their community large and active. Coanda and Aupers (2020) followed for one year the members of a women's guild of 120 members and studied their interactions on social networks.

Besides surveys, ESO has been investigated by computational analyses. For their study about state saturation attacks, Bryant and Saiedian (2021) scraped thousands of threads from ESO official forum and computed prevalence of terms such as "PVP", "fairness", "difficulty", "damage-per-second", and discussions related to the lack of efficiency of the network. Koomen (2023) finetuned a large language model to generate quest descriptions.

Fear of Missing Out

The term FoMO appears with the advent of social networks like Facebook or Twitter. It is defined (Przybylski et al., 2013) as a "pervasive apprehension that others might be having rewarding experiences from which one is absent". Przybylski et al. (2013) elaborated a 10-item questionnaire to measure individual FoMO level as low, medium, or high. They connect this level of FoMO to social media engagement, which can be seen by some people as an easy way to access meaningful social interaction, but also an overwhelming burden for others. The same FoMO scale is reused by Duman and Ozkara (2021) and Wetterling et al. (2024) in context of online multiplayer games. Duman and Ozkara (2021) focused on social interactions among guild members, analyzing their potential to bring a feeling of belonging to a community, but also their impact on game addiction. Wetterling et al. (2024) connect FoMO and the players' behavior regarding loot boxes: a gambling system that can bring players quality-of-life gameplay, essential to achieve highly competitive results.

METHOD

The Corpus

The official website of ESO at http://www.elderscrollsonline.com contains a forum section for discussion of the game, launched in May 2014. The ability to post messages in the forum is restricted to only verified owners of the game. The forum contains categories and subcategories such as "Bug Reports", "Housing", or "Customer Support" for different platforms; we focused on the "General ESO Discussion" where the conversation is in English. The forum lists threads by date of most recent comment, except for several pinned recurring threads. In turn, each thread shows a

title, the initial comment, and 30 following comments per page. Some *megathreads* can contain thousands of comments and span over hundreds of pages.

We gathered in October 2024 the threads from the first 300 pages of the General ESO Discussion section, in total 8985 threads. For each thread we collect its title and the textual contents of the initial post and the comments, as well as timestamps of the messages. Out of the threads, we kept those created between the 1st of April 2023 and the 30th of September 2024. We consider each thread as a document. However, we split the *megathreads* into smaller documents by grouping comments created during the same calendar month; to avoid text duplication between such documents, we include the title and initial post only in the first document (first month) of a megathread and keep only the comments for the rest. Ultimately, this yielded a corpus of $D = 8030$ documents.

We preprocessed the documents following a widely used machine learning pipeline: documents are lowercased and tokenized by sentences and by words. At this point the vocabulary contained 80395 unique words. Then the words were lemmatized to their basic forms. The lemmatized corpus contains 63774 words. Finally, the vocabulary was pruned to remove common English stopwords (such as "in", "the", or "for"), one-character tokens and words longer than 20 characters. Words appearing only once or twice in the corpus and words appearing several times but only in a single document were also excluded. Finally, we discarded any token containing no alphanumeric characters. The pruned vocabulary contained $V = 25883$ words. The text of the final documents consisted of the pruned versions of the thread title, initial post, and the comments. The pruned documents contained on average 756 words and 22 comments, with medians being clearly smaller (255 words and 9 comments) showing that the distribution is unbalanced, for instance, 48 documents contained over 10000 words.

Topic Modeling

Topic modeling is a machine learning approach to extract underlying themes of discussion from a corpus of text documents. Unlike hard clustering where documents of a corpus are each assigned to a single cluster, in topic modeling each document arises as a mixture of underlying (latent) topics: for example, a document might discuss both an activity like in-game trials and the perception of grinding for rewards. Each topic is characterized by a probability distribution over the vocabulary words, and each document by the relative proportions of the topics it contains. Several topic modeling methods exist, here we use the latent Dirichlet allocation (LDA) (Blei et al. 2003) which is among the most widely known methods and remains widely used for its simplicity. LDA is an unsupervised machine learning algorithm relying only on the text of the documents: no pre-existing hypotheses about possible topics are needed, and no labeled ground-truth data is needed about the underlying topics in documents, instead the topics are found directly by fitting the LDA model to the corpus. The topics can be given human interpretations by studying their word distributions and the documents where each topic is most strongly prevalent.

LDA uses a bag-of-word representation for documents so that the corpus is represented as a document-word matrix $\Delta = (\delta_{d,v})$, with D (number of documents) rows and V (size of the vocabulary) columns, where $\delta_{d,v}$ is the frequency of word *v* in document *d*. LDA models the probability $p(v|d)$ of word v occurring in document d as a mixture over underlying topics so that

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$$p(v|d) = \sum_k \theta_{d,k} \varphi_{k,v},$$

where $\theta_{d,k}$ is the probability to pick topic k to generate the word and $\varphi_{k,v}$ is the probability to pick word v from topic k. Fitting LDA to data outputs a document-topic matrix $\Theta = (\theta_{d,k})$ of dimension $D \times K$ and a topic-word matrix $\Phi = (\varphi_{k,v})$ of dimension $K \times V$, where K is the number of topics. As the rows of both matrices sum to 1, the d-th row of Θ can be interpreted as a distribution over the topics in document d, and the k-th row of Φ can be interpreted as a distribution over the words in topic k.

LDA has been implemented for various programming languages, with different optimization approaches including variational inference (Blei et al., 2003) and another based on Gibbs sampling as explained in Darling (2011). We used the scikit-learn (Pedregosa et al., 2011) implementation which uses variational inference.

Model Selection

Training LDA requires specifying the number of topics K to be found. This is typically done by dividing the documents into a training and a test set, fitting models with various values of K on the training set and evaluating their likelihood for the test data (Grün and Hornik 2011). Other methods such as topic similarity, topic coherence and information criterion are described and compared for LDA in Bystrov et al. (2024). In general, determining the best choice for the number of topics remains a topic of research. Given the number of topics, the model can be trained several times on the full corpus and the best fitting training run is then picked with a criterion such as best topic coherence as in Lauritano et al. (2023).

In detail, for a corpus of D documents and a trained LDA model, the average topic coherence (see, e.g., Bystrov et al. (2024)) is the average of the pointwise mutual information (PMI) when we take the co-occurences of the most probable words emitted by each topic. For a topic indexed by k we consider the set S of the n most probable words, which correspond to the highest entries of the the k-th row of the topic-word matrix Φ, and the subset of two elements of S. If we choose n = 20, we get 20×19 = 190 such subsets for each topic. The average PMI for that topic is:

$$\frac{1}{n \cdot (n-1)} \sum_{\{u,v\} \subset S} \ln\left(\frac{p_{u,v}}{p_u \times p_v}\right),$$

where p_u, p_v and $p_{u,v}$ are the respective probabilities to observe the presence of the word u, the word v and the simultaneous presences of the words u and v when picking randomly a document of the corpus. When the presence of two words in the corpus is independent, the ratio equals one, and the logarithm zero. When this ratio is above one (and the logarithm positive), the two words appear together more than by chance.

In this work, to decide on the number of topics, we assign randomly half of the 8030 documents to a training and half to a test subset. We consider numbers of topics between 10 and 200 at intervals of 10 topics. For each number of topics, we fit 10 language models and compute their average topic coherences on the training and test subsets. The outcome is shown in Figure 1 where the best median of the topic coherence on the test set is reached for 50 topics. Thereafter, we train 10 new models

with $K = 50$ topics on the full data, compute their topic coherence, and select the model with the highest one. We use this final model to analyze our corpus.
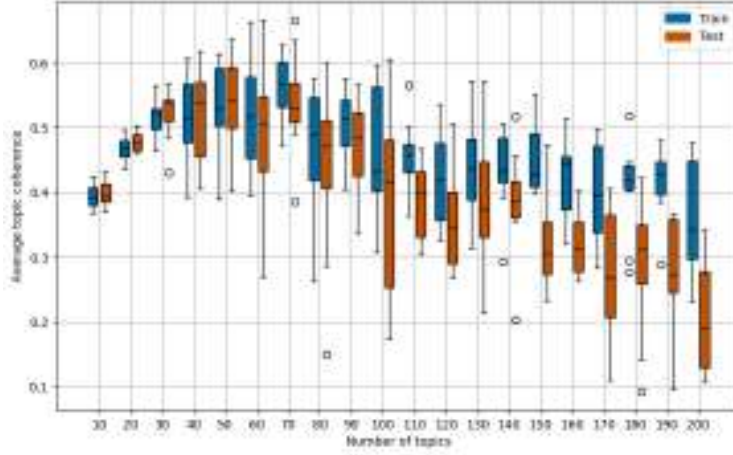

Figure 1: Boxplots representing the average topic coherence for models trained with different number of topics. The horizontal lines inside the boxes show the medians, the circles are outliers. The highest median for the test set is reached for 50 topics.

THE RESULTS

Naming the Topics

To interpret the topics, we observe their best words and matching documents.

For each topic k, we use the topic-word matrix $(\varphi_{k,v})$ to extract the most probable words. Sometimes, the most probable words of a topic may be frequent in the corpus overall and hence less informative about the specific topic. For instance, one topic has as most probable words "game, look, like, animation, old, eso, model, would, new, think" which are mostly overall common words. To find meaningful words for the topic, one strategy is to compute FREX values (Bischof and Airoldi, 2012) of the words. The FREX value of word v_0 in topic k_0 is

$$\text{FREX}(v_0, k_0) = \frac{2}{\frac{1}{F} + \frac{1}{E}},$$

where F is the rank of v_0 according to its word probability in the topic, i.e. its rank among $(\varphi_{k_0,v})_{1 \leq v \leq V}$, and E is the rank of v_0 among values $(\varphi_{k_0,v}/C_v)_{1 \leq v \leq V}$ where the normalizer $C_v = \sum_k \varphi_{k_0,v}$ downweights words active in all topics. Top FREX words of a topic k_0 denote words that are frequent in k_0 and not frequent overall. For the same example topic, top FREX words become "graphics, texture, patron, 3d, deck, underwater, physics, cards, engine and reshade", which tells more clearly that the topic is about graphics and animation.

For the same topic k, we extract the documents with the highest probability. They simply correspond to the highest probability values in the column of the document-topic matrix $(\theta_{d,k})_{1 \leq d \leq D}$. We also compute the perplexity (Jurafsky and Martin, 2024) of topic k language model for all the documents,

$$\text{perplexity}(k, d) = e^{-\sum_{v=0}^{V} \delta_{d,v} \ln \varphi_{k,v}},$$

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where $\delta_{d,v}$ is the frequency of the word v in the document d and $\varphi_{k,v}$ is the probability of picking the word v for the topic k. Then we extract the documents with lower perplexity which are the least surprising ones for that topic.

Presentation of the Topics

The 50 topics extracted by the model are presented in Table 1 with the lists of their ten most probable and best FREX words. We sorted the topics by their prevalence, which corresponds to the percentage of the corpus words generated by each topic. We were able to give a suitable descriptive name for all the topics. To present the topics in an organized way, we further created a higher-level grouping of the documents into five categories as shown in Figure 2. The tasks of naming the topics and grouping them is done manually based on their best words and best documents, which were analyzed based on the authors' knowledge of ESO and its terminology.

Overall, the topics show varied and in-depth discussion of ESO ranging from its gameplay aspects and modes to its collectibles as well as requests and suggestions by the players. We next present a brief description of the topics in each group, where the titles of topics are written in **bold** and the best words, either top or FREX, are written in *italic*.

Bugs and gameplay requests
1. Feature requests
2. Players' general experience
3. Game behavior moderation
9. Social networks communication
12. Playing on consoles and PCs
16. Bug reports
19. Server issues
23. Login reward issues (F)
29. Bugs and assistance
33. Launcher and UI bugs
34. Annoying arcanist effects
38. Graphics and animations

Events and game modes
7. Infinite Archive and difficulty (F)
8. Group dungeons roles and fakes
10. Quest help and concerns
11. Bosses and events (F)
18. Expansions and upcoming features
21. Gold road expansion lore
32. Events and anniversary
41. Trials
50. Recurring events

Combat
4. PVP features and balance
5. Stealth
14. Attack types and balance
36. Damage and recoveries

Collectibles
6. Achievements and armory (F)
15. Market trade (F)
20. Skill lines and scribing (F)
22. Equipment sets and effect processing
24. Grinding (F)
26. Crown Store
27. Endeavors and rewards
28. Leads and drops
30. Crafting material
35. Ink drop
39. Scripts
40. Crate rewards (F)
46. Golden vendor
49. Crown crates

Characters and cosmetics
13. Classes
17. Look and style
25. Companions
31. Houses
37. Playable races
42. Permaglow
43. Mounts and song
44. Polymorphs
45. Fishing
47. Luxury furniture
48. Werewolves and vampires

Figure 2: The 50 topics grouped into 5 groups. Player's FoMO discussions are collected from the topics marked with (F).

	Topic (Preval.%)	Top words with highest probabilities [P] and FREX values [F].
Topic 1	Feature requests (8.8%)	[P]: would player want make game like people could think change [F]: implement argument suggestion propose solution player agree allow optional would
Topic 2	Players' general experience (7.4%)	[P]: game play eso like player time people get make content [F]: mmo mmorpg le de rpg audience pour genre attract multiplayer
Topic 3	Game behavior moderation (4.3%)	[P]: people say player get someone use ban chat know game [F]: ban exploit private harassment chat violation law harass whisper context
Topic 4	PVP features and balance(3.2%)	[P]: pvp player group cyrodiil get pve campaign people kill go [F]: campaign ballgroup bg pvper siege cyro ball ic cyrodiil zerg
Topic 5	Stealth (3.1%)	[P]: get use combat kill attack like time one go run [F]: detect detection phobia invisibility jumping guard dodge jump macro snipe
Topic 6	Achievements and armory (3%)	[P]: character account achievement one level use get alt need slot [F]: wide armory alt awa storage inventory 3600 achievement toon char
Topic 7	Infinite Archive and difficulty (3%)	[P]: arc get boss run one archive solo time go ea [F]: arc ea verse vision marauder duo leaderboard tho gothmau endless
Topic 8	Group dungeons, roles and fakes (2.9%)	[P]: dungeon group tank run player get healer queue people dp [F]: fake taunt dd tank finder healer role pug queue group
Topic 9	Social networks communication (2.8%)	[P]: forum post http thread com discussion en elderscrollsonline see go [F]: elderscrollsonline forum discussion com twitch stream threads streamer communication reddit
Topic 10	Quests help and concerns (2.8%)	[P]: quest zone story character one go main like get start [F]: prologue tutorial giver storyline quest story epilogue questor cadwell glenumbra
Topic 11	Bosses and events (2.7%)	[P]: boss player overland dungeon get group one solo content difficulty [F]: overland nymic seeker bastion harrowstorm difficulty herald boss challenge wb
Topic 12	Playing on consoles or PCs (2.7%)	[P]: server pc game console would play performance eso xbox use [F]: hardware crossplay microsoft ps4 sony merge software performance playstation geforce
Topic 13	Classes (2.5%)	[P]: damage class heal skill buff ability second arcanist use templar [F]: blastbone necro stalk brutality spammable templar gl sorcery heal dot
Topic 14	Attack types and balance (2.4%)	[P]: build dp player ha use attack one people damage get [F]: ha parse oakensoul weave dummy weaving dp empower oakensorc nerf
Topic 15	Market trade (2.4%)	[P]: guild gold price sell item trader player buy time go [F]: trading trader inflation economy listing ttc auction bid market price
Topic 16	Bug reports (2.4%)	[P]: bug fix get issue patch happen work go change back [F]: bug fix patch report glitch stuck reset incremental test note
Topic 17	Look and style (2.3%)	[P]: style look outfit motif like skin costume dye use character [F]: dye hip flaps hair outfit costume cape hairstyle belt adornment
Topic 18	Expansions and upcoming features (2.3%)	[P]: new chapter get year content dlc release necrom update road [F]: chapter q4 road expansion hype necrom deluxe release june q3
Topic 19	Server issues (2.3%)	[P]: get issue server log queue lag time game error try [F]: crash ping disconnect lag connection latency error isp spike boot
Topic 20	Skill lines and scribing (2.2%)	[P]: skill class line would weapon like use new could ability [F]: spear grimoire spellcrafting unarmed destruction wield stave crossbow line elemental
Topic 21	Gold Road expansion lore (2.1%)	[P]: like would think lore one see also know could make [F]: prince ithelia winterhold trailer realm falinesti hermaeu solstheim meridia jyggalag
Topic 22	Equipment sets and effect processing (2.1%)	[P]: set pvp use build proc make meta pve damage like [F]: proc azureblight meta corrosive plaguebreak mitigation perfected azure set purge
Topic 23	Login reward issues (1.9%)	[P]: account day reward maintenance na eu pc claim server log [F]: maintenance orsinium claim downtime rollback edt megaserver email utc 00
Topic 24	Grinding (1.9%)	[P]: get page drop event style grind box time hours people [F]: geyser compensation dolmen page grind trueflame worm 16k compensate replica
Topic 25	Companions (1.8%)	[P]: companion like character use one get would quest bastian rapport [F]: rapport bastian mirri isobel companion ember azandar romance tanlorin zerith
Topic 26	Crown store (1.7%)	[P]: crown buy store free pay gold game eso purchase gift [F]: gifting subscription crown sub subscribe fraud store cash subscriber gift
Topic 27	Endeavors and rewards (1.6%)	[P]: daily reward endeavor get one complete day quest time week [F]: endeavor endeavour weekly daily heist task seal award activity reward
Topic 28	Leads and drops (1.6%)	[P]: lead drop get one map treasure fortune rng style key [F]: fortune lead codex dig filer alternatively curation curated archival antiquity
Topic 29	Bugs and assistance (1.5%)	[P]: addon thank move category thread greeting understanding use topic think [F]: greeting review category understanding addon appropriate assistance topic ui gamepad
Topic 30	Crafting material (1.5%)	[P]: writ craft survey mat get gold material master potion jewelry [F]: columbine survey voucher plating writ grain tripot mat pot material
Topic 31	Houses (1.4%)	[P]: house housing would home furnishing guild like one place add [F]: house housing decorate tours tour visitor home eht villa structural
Topic 32	Events and anniversary (1.4%)	[P]: event ticket get year cake anniversary one last time end [F]: cake ticket event confetti jester slice jubilee impresario whitestrake anniversary
Topic 33	Launcher and UI bugs (1.4%)	[P]: game screen use steam launcher setting change mail update file [F]: launcher font cache file folder steam exe install patcher libhistoire
Topic 34	Annoying class effects (1.3%)	[P]: pet like see arcanist make effects people look get green [F]: twilight flash sickness crux flashy flappy triangle migraine neon motion
Topic 35	Ink drop (1.2%)	[P]: drop ink node get farm rate harvest scribe resource chest [F]: ink node luminous plunder painting beetle shroom harvest rate parchment

Table 1: The 50 extracted topics (continued on the next page)

	Topic (Preval.%)	Top words with highest probabilities [P] and Frex values [F].
Topic 36	Damage and recovery (1.2%)	[P]: cp weapon passive buff damage bonus increase stamina armor health [F]: stamina stat crit cp critical stam bonus recovery xp magicka
Topic 37	Playable races (1.1%)	[P]: race character bosmer argonian like look khajiit elf make nord [F]: race bosmer nord elves dunmer altmer orc argonian racial breton
Topic 38	Graphics and animations (0.95%)	[P]: game look like animation old eso model would new think [F]: graphics texture patron 3d deck underwater physics cards engine reshade
Topic 39	Scripts (0.9%)	[P]: get script chest loot one plan book purple item box [F]: script scraps loot container trove affix scholarium chest fence book
Topic 40	Crate rewards (0.83%)	[P]: crate get reward mount gem crown pet one item free [F]: gem crate apex camel guar pacrooti radiant legendary gamble marking
Topic 41	Trials (0.81%)	[P]: trial content normal vet dungeon gear endgame veteran level casual [F]: endgame trial hm veteran casual vet trifecta raid normal content
Topic 42	Permaglow (0.75%)	[P]: glow weapon change red like skill effect visual look focus [F]: glow grim permaglow sheathe permanent gloambound red arms nightblade glowing
Topic 43	Mounts and songs (0.75%)	[P]: mount like sound animation horse voice music emote love one [F]: song soundtrack instrument mute horse emote idle bard pronounce voice
Topic 44	Polymorphs (0.71%)	[P]: polymorph cat animal one would use like language make female [F]: english raht translation language noun animal polymorph child molag french
Topic 45	Fishing (0.69%)	[P]: fish fishing thank love pc thanks get would happy much [F]: fish fillet mug filet fishing angler reel shadyjane62 nahlia santa
Topic 46	Golden vendor (0.48%)	[P]: http vendor uesp en wiki ring set item online [F]: 000ap necklace impenetrable ring infuse wiki uesp covenant net dominion
Topic 47	Luxury furniture (0.42%)	[P]: 000g item transmute luxury crystal http furniture furnisher eso vendor [F]: furnisher luxury 500g theran reconstruct zanil geode located ocuyjezwxki crystal
Topic 48	Werewolves and vampires (0.33%)	[P]: werewolf vampire form use ww would skill transformation stage vamp [F]: werewolf ww vampire transformation vamp vampirism behemoth insightful bite mist
Topic 49	Crown crates (0.23%)	[P]: flame return statue soul monkey back first door shrine atronach [F]: monkey factotum chariot atari automaton pong exclusivity lunar floppy statue
Topic 50	Recurring events (0.11%)	[P]: holiday life happy christmas new year celebrate ms festival request [F]: holiday xxx christmas japan celebrate birthday shout merry ms wink

Table 1: The 50 extracted topics (continued from the previous page)

Bugs and Gameplay Requests

Topic 1 **Feature requests** contains *player*'s *suggestion*s to *implement* new features. For example, players are asking to "show champion points in the encounterlog" or requesting a "toggle option" to decide if the characters share their achievements or earn them individually. Such requests are addressed to the game developers. Topic 2 **Player's general experience** is a theme where players share their feelings about the *game*, how much *time* they spend on it and the reasons why they *like* it. The FREX words contain three French stopwords, which had therefore not been pruned, the next three FREX words would be *enjoyment*, *teso* and *meaningful*. In top documents, people discuss why they "love the Elder Scrolls series" or "what makes ESO special".

In **Topic 3 Game behavior moderation** players relate inappropriate behavior in the *game* and in the internal *chat*. It contains discussion about the "automated chat moderation system", its limitations and how to improve it. Topic 9 **Social networks communication** talks about discussions happening on other social networks like *Reddit* or *Twitch*. Topic 10 concerns *Playing on consoles and PCs*, mentioning *crossplay*, *xbox* or *ps4*. Many topics report about general bugs (**topic 16**), issues with the server or with the login process (**topics 19** and **23**), issues with the launcher (**topic 33**) or graphics and animations bugs (**topic 38**) with a specific topic about the arcanist and sorcerer classes and their annoying animation effects (**topic 34**), where an arcanist may be surrounded by floating symbols or a sorcerer may have a large flying pet obscuring the screen.

Events and Game Modes

Several topics discuss various game modes located in different *zones* which contain activities grouped in *quests*, and in Topic 10 **Quest help and concerns** players ask for assistance to navigate the zones. New zones are available as DLC when purchasing **expansions** (topic 18) and Topic 21 is more dedicated to *Necrom* and Gold *Road* which

are two *chapters* (major zones) released in 2023 and 2024 and to their connecting DLC Scions of *Ithelia*.

Topic 7 discusses a game mode called **Infinite Archive** (previously *Endless* Archive) which features repeated series (*arcs*) of small arena fights ending with final *bosses* and which can be played *solo* or *duo*. **Dungeons** (topic 8) are player-versus-environment (PVE) with *groups* of players with three different roles: *tank*, *healer* or *damage dealer (dd)*. Players can form or seek groups through a *finder* and may need to *queue* before finding a group. Some players declare a role that does not correspond to their characteristics and are named *fake* by others. In topic 41, **trials** are a more
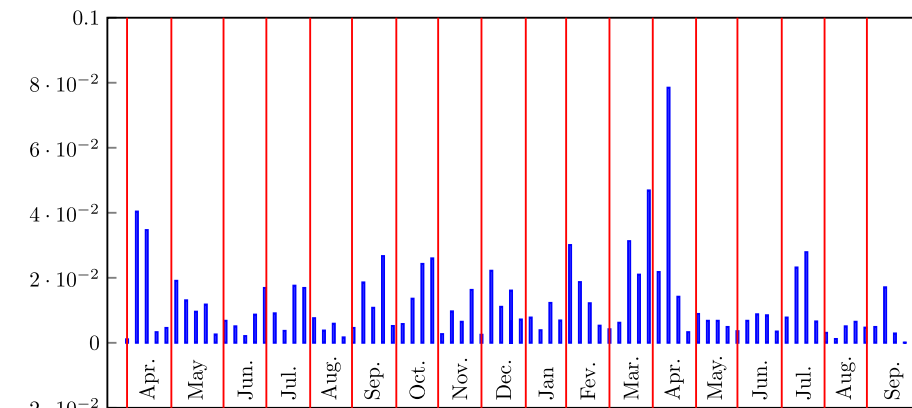

Figure 3: Weekly prevalence of the words generated by topic 32 (events and anniversary)

difficult type of dungeons which further feature *veteran* modes intended for experience players. Topic 11 **Bosses and events** contains mixed content about *bosses*, *dungeon*s and various types of "world events" which are special encounters that activate occasionally in some game locations.

Special recurring events (**topic 50**) are available only during some specific periods of the year, for *Christmas*, *new year* or during *holidays*. For the 10th *anniversary* of ESO held special events mentioned in **topic 32**, and a *jubilee* event in April 2024 which explains the peak activity of this topic shown in Figure 3.

Combat

Topic 4 deals mostly with PVP combat, mentioning Cyrodiil, a zone dedicated to ongoing fights between the three game factions. Topic 5 **stealth** deals with different defense techniques such as *dodges* or *jumps*. It also contains discussions on *invisibility* and how not to be detected by *guards*. Topic 14 is about different **attack types** such as heavy attacks (*ha*) and a technique related to canceling animation in light attacks called *weaving*. Topic 36 tells about **damage** caused by *weapons* and the mechanisms linked to *health*, *stamina* and *magicka* which are the three main resources consumed during the fights.

Characters and Cosmetics

When playing ESO, the first thing is to select a **playable race** (topic 37), the choice can be *High Elf* (*Altmer*), *Wood Elf* (*Bosmer*), *Khajiit*, *Breton*, *Orc*, *Redguard*, *Dark Elf* (*Dunmer*), *Nord*, or *Argonian*, with three races available for each faction. Players also

need to choose one of the **classes** (topic 13) which gives access to *skill* lines; *necro*mancer and *arcanist* are popular recently added classes. Physical appearance (*hairstyle*) and the **look and style** (topic 17) are highly customizable, and many *outfits* and *costumes* with multiple *dyes* are available. Skins and **polymorphs** (topic 44), such as *Molag* Bal Illusion, can also radically change a player's appearance. Besides a race and a class, a character can become **a werewolf or a vampire** (topic 48). To move faster, characters can ride *horses* and other kinds of **mounts** (topic 43) and get help from **companions** (topic 25) including *Bastian*, *Mirri*, *Isobel* or *Azandar*. Characters or weapons can be surrounded by a **permaglow** effect (topic 42). Characters can own **houses** (topic 31) they can *decorate* with **luxury furniture** (topic 47) and organize *tours* and host *visitors*. **Fishing** (topic 45) is another popular activity.

Collectibles

Collecting items is a predominant feature in ESO, among those, **equipment sets** and *armors* are discussed in topic 22.

Collectibles can be purchased or sold through **Market trade** (topic 15). This topic contains discussion of trading in-game items for in-game gold currency through trading *guilds*, and characteristics and fluctuation of the resulting virtual economy, with top words including *gold*, *price*, *trader*, *auction*, *inflation*. The topic contains discussions such as how fast certain items sell, need for "gold sinks" or inflation, and impact of time limits of sale listings.

Items can also be purchased in the **Crown Store** (topic 26) which includes some discussion related to FoMO, such as asking when an item pack will go away, or why some collectibles are only rarely (once per year) available, and feelings of overly high "extortionate" pricing for some collectibles. The topic also discusses between-player sales of the crown currency for in-game gold (with words like *gifting*, *purchase*, and *fraud*), an indirect way for players to obtain real money purchasable items for in-game activity, with discussion including typical conversion rates but also misuse such as fraudulent behavior.

A weekly message in the forum discusses the in-game **Golden vendor** (topic 46), providing a list of valuable items to be purchased. Some loot boxes, named *Crown crates* can also be purchased for the real-money-purchasable crown currency, and give access to exclusive rare **crate rewards** (topic 40).

Players can also collect items by completing game activities as mentioned in topic 6 (**Achievements and armory**) or in topic 27 (**Endeavors and rewards**). They can also **Craft materials** (topic 30). **Grinding** (topic 24) consists of repeating the same tasks or quests to "farm" a sufficient amount of collectibles that *drop* randomly from their rewards as a *compensation*. In particular, the topic includes discussion of a special cosmetic weapon style ("Ulvor staff") that was only available during the anniversary event, asking what tasks could drop it, and for other style pages what activities drop them, estimation of the actual drop rates of the collectibles, and whether there are cooldown mechanics slowing down farming. Such discussions show how players approach grinding in an organized fashion and try to make strategic choices for their time use. Topic 28 (**lead drop**) is related to drops of 'antiquity leads' where excavating antiquities provides collectible furnishings. Topic 35 (**ink drops**) contains discussion of farming a recent new in-game consumable item type, Ink.

A recent activity *scribing* (topic 20) enables to open new specific *skill lines*, and the the **scripts** (topic 39) are the resource for that activity.

Players' FoMO Discussions

The 50 topics give a good overview of the active discussions during the 18-month collection period. We also analyze the top documents from topics that would relate to FoMO to analyze players' perceptions about that phenomenon. Those topics are marked with (F) in Figure 2.

Some players regret they do not have enough in-game or real currency to afford what they wish: one defines themselves as "alt-aholic" mostly interested in their characters' outfit and feels that it is very difficult not to spend their gold. Another that they cannot afford ESO Plus and feel very stressed by the game presenting items prominently "in our faces". What is missing can also be storage space and a player requests a specific storage for furniture because they take a lot of space in the game's storage chests and storing them across a player's houses feels "disingenuous".
Occasionally a player misses a collectible because of what they consider a bug and wants to check if others had the same experience, as a player whose character died just before a boss enemy did, and after resurrecting could not receive the expected "vision" reward "as if I had picked it up already", wonders whether that inability happened on purpose. Another player complained the game's dungeon finder tool placed them midway into an ongoing dungeon run and "messed up [their] daily [quest]" since some of the dungeon bosses had already been killed, wanting the behavior to be improved.

Getting other players' acknowledgment could also help support concerns about changes in game features, for instance, one player asked others' views on a new behavior where "guild item mails" expire after only one week even when not logged in, worrying that the period is "excessively short" and they would "just lose that gold" from an item sold while they are away on a two-week holiday. Two other players raised similar concerns about the short duration, one noting that they easily "lose things" when they forget to check their in-game mail often enough, another feeling that getting multiple "item expired" messages at each login is "discouraging [them]" from logging on. This game feature thus makes taking longer breaks have in-game downsides.

The players discuss with others how to use an important resource: their time. A player organized a poll to know which of the in-game world events is the "most annoying" and got 50 answers in two days, where the experience of a "geyser" event was "ruined" by grinding for a rare drop, and the event was considered "boring" and to "take forever". Here the fear is to spend too much time in vain on an activity that does not deserve it, missing time for other more profitable activities. Time management also matters, and when one player asks about an in-game "event-schedule" wondering if they "missed it", others suspect the company (ZOS) of being "secretive" and "hiding the dates" of events to "push" FoMO.

Getting daily rewards has triggered some frustration as players claim abnormal behavior of the login process. A player collecting daily login rewards experienced a bug showing "0 minutes left" to collect a reward, and failing to collect it then caused the "30 day reward [to be] locked".

The last game feature we explore relates to the grinding (or farming) activity. It was especially predominant during the 10-year jubilee period in April 2024 as shown in Figure 4. Players evaluate their chances (the drop rate) to get some items and often mention the random generator (RNG). When one player asks what type of "bound styles" drops, and whether one needs to spend all time farming them, another

answers it entirely "depends […] on RNG". Grinding also seems to cause frustration among the players. After spending "too many hours" repeating geyser events to get a particular style page drop reward, a player wonders where exactly to get "the style page". Other players stated according to their knowledge it came from a "clam shell". A player is losing patience because the "RNG" is "insulting" and after farming in-game world events for around one full day of time they just felt they "wasted" their time. Another replied that they have adult "responsibilities" and wish to spend free time on "more important" things. Another player "wasted [their] weekend" without getting the style page drops they were hoping for and finds it "depressing".
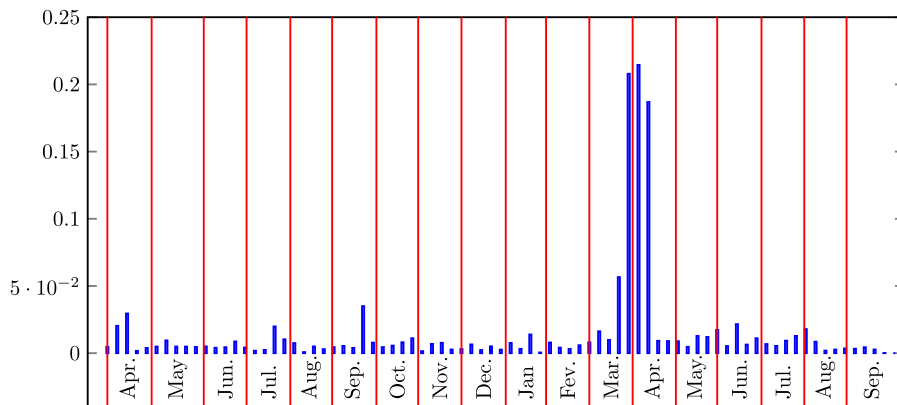

Figure 4: Topic 24 (grinding) reached a peak during the 10-year Jubilee

Some of the players acknowledge and understand that FoMO is an important feature in ESO saying that it is used to "keep players around" and has been used excessively as a tactic since ESO started, and that the game is "designed around" FOMO and "artificial scarcity", that the events have "piled on" FOMO ever more over the preceding two years, leading the player to "not care anymore", and to get what they can and "move on".

The players need to share their experiences on the forum and know if others got the same or better experiences. They also need to play every day to get their daily rewards. According to Przybylski et al. (2013) fearing others might have a better rewarding experience and the desire to stay continually connected are precisely defining the FoMO concept, and the lack of time to access all the potential rewards is also an increasing factor of the FoMO level. In multiplayer games (Wetterling et al., 2024) players also play against each other and competitive players are more vulnerable to the impact of valuable rewards, because they give an advantage to climb the competitive ranking; in ESO cosmetic collectibles do not give such advantages but collecting armor sets, a big part of the game, does. On the other hand, casual players can decide not to spend so many resources and time on the rewards (grinding or crates) because they believe it is not worth the investment, they might have limited leisure time due to life obligations, and they can enjoy the game without performing. Wetterling et al. (2024) state that transparency of the random loot process is important for the players, and that clear understanding of it helps the player to make an informed purchase decision, and that the benefits must be significant to justify the investment. For ESO, it is true both for monetary and for time investment. Otherwise, some players might simply consider giving up on playing.

CONCLUSIONS AND DISCUSSION

In this work, we collected and analyzed a large corpus of player discussion from the official general discussion forum of ESO over 18 months, totaling about 9000 threads and a million words. This relatively large data would be difficult to analyze by exhaustively reading through it, instead we used machine learning to extract major themes of discussion which we coupled with human reading of exemplary top documents. Our goal was to study prominent topics of discussion and analyze players' discussions related to collectible elements and the FoMO phenomenon.

The computational analysis was done by a machine learning approach of topic modeling using the prominent LDA method. After pruning the vocabulary from 80 395 to 25 883 unique words, we trained the LDA model to represent the documents as mixtures of underlying topics where each topic has a distribution over words. Using model selection approaches we chose 50 topics as the best representation. By analyzing top words of each topic and documents with strongest prevalence of the topic, we were able to interpret the topics in a human-readable way and name them, where we were also able to use domain knowledge of ESO and its terminology.

The computational approach allowed us to extract topics of discussion directly from data without imposing pre-existing notions or hypotheses of what topics there should be. Moreover, the modeling also allowed us to quantify prevalences of each topic, by the percentage of the words they have generated, and to present variation of the prevalence of topics over time; this allowed us to observe how some topics were strongly more discussed during the 10th anniversary jubilee of ESO in April 2024. Based on the top words and top documents of the topics, we were also able to connect some of the topical discussion to players' views on collectibles, rewards, loot-boxes, and the concept of FoMO.

Although our approach proved highly useful, we note some limitations. Advanced topic models beyond LDA could yield further insights. LDA requires to choose the number of topics which we set to 50 by model selection approaches, nevertheless other choices could be explored. While most topics had clear interpretations, a few were subtle or possibly a mix of several themes. Lastly, our data arose from the official ESO forum maintained and moderated by the game publisher, hence discussion there may not be as 'free' to express views as on an independent platform. However, even on this forum critical discussion existed on game features; moreover, presence of game developers on the forum may attract players to give feedback, criticism and suggestions with expectation that their views can impact development. Thus, the impact of the forum on the discussion is multifaceted and analysis of ESO discussion on other forums is future work.

Our study revealed the strong impact of the collectible mechanics and FoMO on discussion of ESO. The player community was highly aware of the collectible mechanics. Players were aware of settings such as drop rates as artificial factors rather than natural consequences of the game, and while achieving some drops was appreciated, players expressed frustration with rates they perceived as overly low, or activities that seemed overly burdensome to yield the drop. Moreover, the randomness of the drops was a source of frustration with equal amounts of work not yielding the same reward across players. On the other hand, the community was active in formulating strategies for best managing collectibles.

Collectible mechanics and limited availability have proved advantageous for ESO as evidenced by the longevity of the game. However, our analysis showed that while

players clearly seek collectibles as a major focus of their online discussion and their in-game time use, mechanics that seem overly burdensome can decrease players' enjoyment. After our data collection period in November 2024, ESO launched a new series of "Golden Pursuits", regular limited-time events with unique unlockable rewards. On the other hand, in 2025 it has been revealed ESO will have a new event, bringing back some of the unique rewards that were available in the April 2024 Jubilee. Thus, part of earlier FoMO may over time prove unfounded, even as new sources of FoMO are introduced. Perhaps, following F. D. Roosevelt, the only thing to fear is fear itself.

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ENDNOTES
[1] Data from https://mmo-population.com/r/elderscrollsonline and https://mmostats.com/game/the-elder-scrolls-online retrieved Nov 18, 2024.

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