The Pulse of Your Network :
AI-Driven Community Health Scoring Framework for Microsoft's Viva Engage

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Abstract:

In the age of enterprise collaboration, the health of internal communities on platforms like Microsoft Viva Engage (formerly Yammer) is critical for fostering knowledge sharing, cross-team synergy, and employee engagement. However, business leaders often lack clear visibility into community vitality and where targeted intervention is needed. This study proposes an AI-powered framework to assess community health by simulating Yammer-like environments using public threaded-discussion data from Reddit.

We design and validate a Community Health Score (CHS) that quantifies engagement trends across dimensions such as weekly active users, topic engagement, contributor recurrence, and reply depth/latency. Leveraging Python and visualization tools like Vercel and PowerBI, we develop a real-time dashboard for monitoring key health indicators. Natural language techniques including BERTopic and GPT-4 are used for topic modeling, sentiment summarization, and post intent classification.

Our study demonstrates that community health within enterprise social platforms is both measurable and predictive. By combining quantitative engagement metrics and LLM-driven qualitative signals (e.g., civility, empathy, relevance), we identify that high activity alone does not indicate vitality. Instead, content quality and semantic depth are stronger predictors of sustainable engagement. Patterns such as ghost posts, reply delays, and contributor concentration serve as early warning signals of decline. Additionally, we observe that community type significantly influences which health factors matter most—support groups prioritize empathy, while product teams value responsiveness. Our CHS framework effectively detects pseudo-active or toxic communities, offering a scalable and adaptable solution for enterprise community monitoring and intervention..

Keywords: Community Health Index; Enterprise Social Platforms; User Engagement Metrics; Topic Modeling and Sentiment Analysis; AI-Powered Dashboard Design

1. Introduction

Human interaction within the workplace has evolved leaps and bounds, from water cooler chats and old boys' network to virtual connectivity through social media. When workplaces and workforces evolve

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to integrate life into work and work into life, internal office communication tools for instant messaging fail to capture the contextual richness people who make up the workforce bring to the workplace. This lacuna is increasingly being filled with Enterprise Social Networks (ESN), platforms where employees seek and share knowledge, life updates, and learn to navigate their social identities at work and beyond. ESNs gain particular significance for employees navigating remote and hybrid work environments, by serving as the digital manifestation of the company culture.

We examine one such ESN more closely: Microsoft's Viva Engage, formerly known as Yammer. Yammer began in 2008 as an internal communication system. Since being acquired in 2012 by Microsoft and rebranded in 2023 as Viva Engage, the platform has evolved from a simple internal communication system to a comprehensive employee experience tool.[i] (Waghmare, 2024)

Beyond the benefits of sharing real-time updates, Viva Engage acts as a platform for community building. Employees and community members unite around shared interests, identities, roles, and initiatives. Another key feature of Viva Engage is peer collaboration and knowledge sharing, where community members can crowd-source resources, best practices, and problem-solving from their peers. For leaders and employees aspiring to leadership positions, Viva Engage serves as a platform for visibility and access. The Leadership Corner allows leaders to keep track of engagement metrics, and allows direct access to top leadership, an especially beneficial feature for large companies with silo-ed departments. Leaders are empowered to host AMAs, mentor employees virtually, and identify top talent.

Harnessing the full potential of an ESN like Viva Engage can potentially lead to rich dividends for the organization culture and community. Recognizing this potential, it becomes all the more important to understand what makes online communities successful[ii] (Wehner et al, 2017). Viva Engage's advanced analytics tool enables insight into the performance of individual posts and engagement metrics in various communities. The Network Effect, or enhancement in the utility of a product or service with higher adoption by users, has been shown to contribute to the growth of online communities, pointing to the importance of measuring engagement metrics to optimally leverage these network effects[iii] (Gopalsamy et al, 2017)

This paper explores how these engagement metrics can be crystallized into a Community Health Score (CHS), offering a quick snapshot into which communities are successfully engaging its members, have active, contributing members, relevant discussions, and is overall a welcoming digital space for old members and new. The Community Health Score can thus alert business leaders to communities in need of attention- communities that have few posts, declining members, irrelevant posts etc. This CHS is validated on publicly available data similuted from Reddit, a popular forum social media platform, mimicking Viva Engage's collaborative nature through community interaction and knowledge sharing. The CHS model incorporates quantitative analysis of engagement metrics like number of members, traffic volume, responsiveness, interaction and liveliness, as well as AI powered qualitative analysis including tone and sensitivity analysis, civility and toxicity detection, and helpfulness indication. The composite CHS is thus a useful tool in the arsenal of HR leaders to monitor employee sentiment, and for business leaders to identify communities of growth and potential.

2. Literature Review:

2.1. Online community health: opportunities and challenges:

Empirical research on online community health has gained traction in recent times. Kraut et al. (2017) [iv]examined the social antecedents and imperatives in studying the emergence and growth of online communities. As virtual spaces that generate resources and belongingness transcending the limitations of time, space and scale, the rise of online communities offer insights into how newcomers to an online community are welcomed, new communities started, and old communities sustained. Kraut et al (2017) also describe what makes online communities thrive and fail. The most meaningful indicator of a successful community is its ability to generate resources- the richer the inventory of content, the more users the community attracts. With the ability to leave and join communities being equally easy, ensuring that the community is active and abundant is crucial to set itself apart from other communities. A potential threat to online community health is under-contribution ("lurking" in Reddit parlance), a manifestation of the Power Law distribution, where few members contribute most of the content, while a majority of the members contribute little to no resources. Other researchers have also flagged the issue of contribution skew and its discouraging impact on users. (Preece, 2001; Cunha et [v]al, 2019). Kraut et al (2017) observed this phenomenon across the board in both successful and unsuccessful online communities, leading to the conclusion that if under-contribution is inevitable, encouraging the minority members to post consistently is crucial for the community's survival, a finding supported by Preece (2001) who observed that when the engaged members' activity approaches a critical mass, it negates the inactivity of the lurkers.

Another feature of thriving communities is proactive moderation and regulation, which not only promotes veracity and credibility of content, but also keeps toxicity, spurious bots and individuals at bay, ensuring an inviting community culture. Kraut suggested exploring the role of algorithms in attracting new members to a community- by using algorithms to summarize past community activity, introduce members to each other, notify new members of key events, online communities can leverage algorithms to enhance belongingness for new members.

2.2. Quantitative attributes of online community health:

The measurement of attributes denoting the success or failure of online communities has been of significant academic interest. Preece (2001) [vi]identifies key attributes to measure success in the form of the 'sociability' of the online community: the extent to which software, policies and practices support social interaction online, and usability: the ease with which individuals are able to learn to use the online community tool. Chief among the sociability measures (which are the focus of this paper) are measures that contribute towards aligning people from myriad backgrounds, needs, and identities on a shared purpose, and the policies and protocols that regulate social behaviour in these communities. The level of engagement (number of messages per member per member) was found to serve the purpose of the community, for which 'thread depth', of the number of replies/ comments could be utilized as a proxy. Preece also suggests measuring reciprocity- the ratio of the number of questions asked by a member to the number of responses made by them. Lurking was found to be an extension of skew in reciprocity and contribution of members, with lurkers numbering as high as 90%.

A key policy attribute was moderator activity- the effectiveness of a rules-based order and prevention of abusive, violent behavior was seen to contribute to the overall trustworthiness of the online community.

Other quantitative metrics studies by researchers include ‘growth’, measured by the number of new users contributing content, retention rate, measured by the average number of users returning to post in the community, volume of activity, measured by the average number of posts per month and survival rate, measured by the percentage of activity in the last 3 months (Cunha et al, 2019).

Perreault and Mosconi (2019) track attributes for guaging social media engagement across three categories: Consumption (a passive form of engagement measured by views, clicks and reads), Creation (active engagement gleaned by measuring the number of new and original posts) and Contribution (judged by measuring the number of comments and replies). While they identify the commonly used behavioural metrics of likes, comments, shares, mentions and follows, they also suggest some other valuable metrics like cursor activity (how long someone stays on a post), uploads/downloads, embeds and tags which signify cross-platform engagement.

2.3. Lithium model Community Health Index (CHI)

The Lithium Community Health Index (CHI) represents a pioneering approach to standardizing community health measurement across online platforms, with subsequent adaptations demonstrating its practical applicability to diverse social media ecosystems including Reddit. This foundational framework establishes comprehensive methodology for quantifying community vitality that directly parallels our objectives for Microsoft Viva Engage communities.

a. Foundational Framework and Theoretical Underpinnings

The Lithium CHI framework addresses a critical gap in community analytics by providing a unified standard for measuring community health comparable to established metrics like FICO scores or Body Mass Index. Developed through extensive analysis of proprietary data spanning billions of interactions, millions of users, and scores of communities over nearly a decade, the framework identifies six core health factors that accurately represent key attributes of thriving communities: Members, Content, Traffic, Responsiveness, Interactivity, and Liveliness.

The theoretical foundation rests on well-established principles including Network Effect Theory (Metcalfe's Law), Information Quality Theory, and Social Network Density Theory. These theories support the framework's core premise that healthy communities exhibit measurable characteristics enabling them to meet member needs while achieving organizational objectives.

b. Dual-Category Health Assessment Model

The CHI framework categorizes health factors into two distinct groups with different predictive capabilities:

c. Diagnostic Indicators (Members, Content, Traffic)

These metrics reflect current community state and correlate strongly with community size. They function as historical records of community impact and intervention effectiveness, providing snapshots of immediate community appeal and engagement levels.

d. Predictive Indicators (Responsiveness, Interaction)

These behavior-pattern metrics are less susceptible to size effects and function as early warning systems for potential health issues. They indicate future community trajectory and provide actionable insights before problems manifest in diagnostic metrics.

e. Mathematical Formulation and Normalization Strategy

Lithium's CHI employs sophisticated mathematical modeling ensuring cross-community comparability. The health function combines factors through geometric mean principles:

$$H_0 = \sqrt{(\mu \times U \times vh \times R \times I \times L)}$$

This multiplicative combination ensures balanced health across all dimensions, preventing any single factor from compensating for complete failure in another. The framework incorporates advanced normalization techniques including:

1. Logarithmic scaling for handling power-law distributions typical in online communities
2. Variance stabilization through square root transformations for interaction metrics
3. Outlier management via min/max capping to prevent extreme values from distorting analysis
4. Temporal smoothing using hybrid algorithms combining weighted moving averages with kernel smoothing

This paper adapts the metrics used by Lithium in developing their CHI to develop a CHI score for Reddit's communities mimicking Viva Engage communities.

2.4. AI augmentation for community health insights

The burgeoning use of online communities presents a pressing need for monitoring qualitative aspects of community health like empathy, relevance, helpfullness. For large communities with millions of participants, human moderators have to devote undue time, energy and resources in keeping the discussions civil and helpful. LLMs can thus be leveraged to perform these tasks of administrators- by monitoring and flagging unhelpful discussions, toxic interactions, sentiment analysis.[vii] (Open AI, 2023)

We look to Chancellor et al (2016)[3] to inform how to measure empathy and peer support. Their research suggests that the emotional tone and context of comments can not only be distinguished by deep neural networks, but also highlights the role of moderation and norms in guaging the quality of support. This finding was also supported by Kiene et al (2016), who found that well defined norms and collective peer action on enforcing norms contributed to the resilience of a subreddit that faced a sudden influx of new users.

Toxicity detection is another qualitative attribute that informs the health of online communities. Siersdorfer et al (2014) provide a useful approach to study toxicity detection and norm non-compliance in subreddits. By studying moderator comments on a sample of subreddits, Siersdorfer et al refined a new database that not only captured the small sample of events that invite moderator action, but also captured the norm violations not explicitly flagged by moderators. Further, they used a classification approach combining linguistic, structural and behavioral features to predict civility in comments. Their findings help inform markers of civility: the use of personal pronouns, sentiment words and politeness

[3] Chancellor et al. (2016) – "Norms Matter: Contrasting Social Support Around Behavior Change in Online Weight Loss Communities"

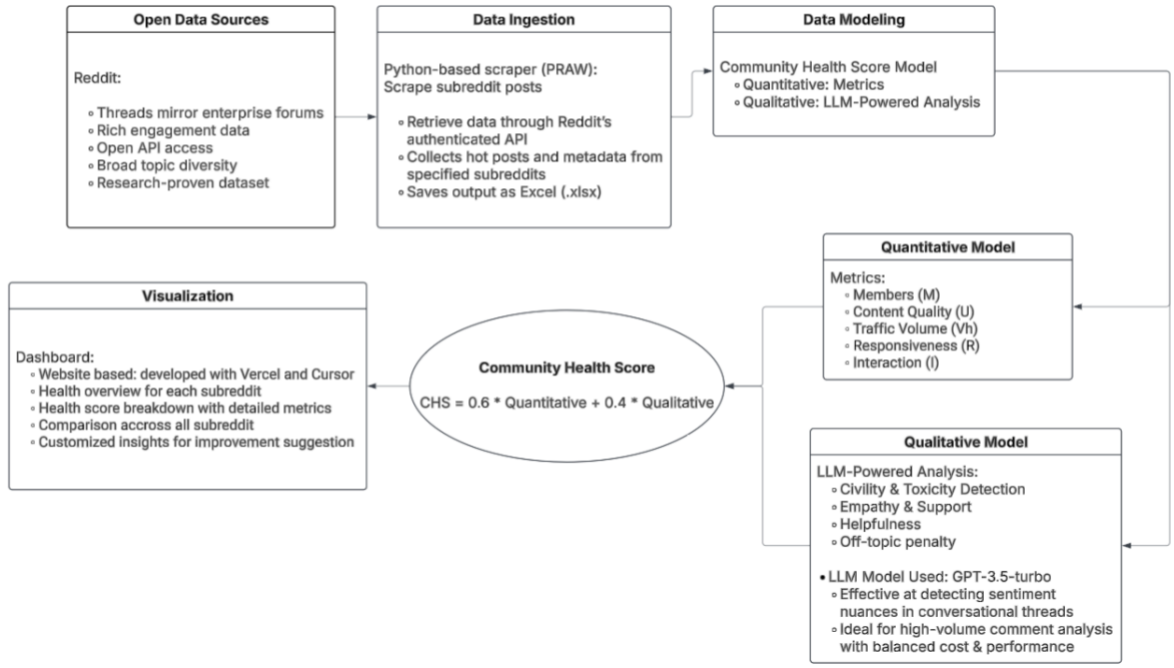
markers, in addition to thread depth, where comments deeper in the thread were found to be more thoughtfully worded and civil.

Ashktorab et al (2014)[4] highlight the limitations of human moderation in mitigating cyber-bullying on Twitter, and advocate for the use of automated and scalable methods to discourage the same. These researchers built a model to detect bullying by using machine learning classifiers and linguistic features (unigrams, bigrams, profanity, sentiment scores and metadata)

For the purposes of this paper, the Open AI LLM Best Practices (2023)[5] sheds light on designing prompts to accurately flag harmful content in text as well as image formats. Open AI uses the models omni-moderation-latest and text-moderation-latest to flag problem content across various categories including harassment, sexual content, hate speech, self-harm among others, which serve as anchor points for LLM based toxicity scoring systems.

While Open AI's classification system is robust, Binns et al (2017)[viii] sound a note of caution in over-automation, especially where community norms are complex, diverse, and not context-rich

3. Methodology



3.1. Community Simulation via Subreddit Mapping

To emulate the structure and communication dynamics of Microsoft Viva Engage communities, we developed a rule-based subreddit selection framework grounded in the core types of discussions typically observed within enterprise social networks. Drawing from Microsoft Viva Engage's ecosystem—which includes functional team collaboration, employee resource groups (ERGs), and

4 Ashktorab et al. (2014) – "Designing Cyberbullying Detection Algorithms on Twitter"
5 https://platform.openai.com/docs/guides/moderation

cross-functional knowledge sharing—we classified subreddit communities into three major categories: department-based communities, peer support/identity-based groups, and knowledge-sharing spaces.

a. Department-Based Communities

These subreddits serve as proxies for organizational functional teams (e.g., Marketing, Engineering, HR), capturing enterprise communication formats such as Q&A, announcements, and feedback exchanges. Selection criteria included subreddits with domain-specific collaboration, technical inquiry, or business operations focus. Representative examples include r/marketing, r/devops, and r/humanresources.

b. Peer Support and Identity-Based Communities

These communities reflect the structure and intent of ERGs or affinity groups within organizations. They foster peer connection, emotional well-being, informal mentorship, and identity-based discussions. Selected subreddits focus on caregiving (e.g., r/Parenting), LGBTQ+ support (e.g., r/lgbt), gender-focused workplace experience (e.g., r/TwoXChromosomes), mental health (e.g., r/mentalhealth), and regional belonging (e.g., r/ontario).

c. Knowledge Sharing Spaces

This category mirrors internal knowledge hubs and skill-building forums in corporate environments, where employees share expertise and collaborate on problem-solving. Subreddits were chosen based on high levels of peer-driven content, tutorials, and technical discourse. Domains include Data & AI (e.g., r/datascience, r/artificial), Engineering (e.g., r/learnprogramming), Product and UX (e.g., r/productmanagement), and Finance (e.g., r/personalfinance).

Framework Rationale

This structured approach ensures broad representation of enterprise-style communication, mapped across three strategic dimensions:

1. Formal collaboration via department-based communities
2. Informal and emotional support via identity-based peer groups
3. Skill development and learning via cross-functional knowledge sharing

The selection methodology strengthens the ecological validity of the simulated community environment by aligning subreddit characteristics with workplace discussion typologies identified on Viva Engage. This mapping enables a more accurate analysis of community health indicators and engagement dynamics in a corporate social network context.

3.2. CHS Metric Design

a. Reddit-Specific Implementation and Adaptation

The adaptation of CHI methodology to Reddit's ecosystem demonstrates the framework's versatility and practical applicability. The Reddit implementation translates the six core factors into platform-specific metrics:

1. **Members Factor**: Subscriber growth rates, retention metrics, and new member acquisition patterns, scaled logarithmically to handle Reddit's vast range from hundreds to millions of subscribers.
2. **Content Quality:** Leverages Reddit's voting system through upvote-to-downvote ratios, comment-to-post ratios, and engagement proportions, incorporating democratic validation principles.
3. **Traffic Volume:** Utilizes engagement scores and comment volumes as proxies for page views, accounting for Reddit's unique interaction patterns.
4. **Responsiveness:** Measures comment response times and reply percentages, adapted to Reddit's daily/weekly usage patterns with expected response times of approximately 1000 minutes.
5. **Interactivity:** Combines unique contributors per thread with average comments per thread, using square root transformation to balance breadth and depth of engagement.
6. **Liveliness:** Applies arctangent functions to normalized activity levels, creating S-curve behavior that rewards organic engagement while preventing spam/bot inflation.

b. Scoring Methodology and Practical Applications

The Reddit implementation demonstrates sophisticated parameter justification based on platform-specific behavior patterns. The final scoring system produces values on a 0-1000 scale with established benchmarks:

<400: At-risk community
400-600: Developing community
600-800: Healthy community
800+: Exemplary community

This scoring framework enables meaningful comparisons between different community types while providing actionable insights for improvement strategies.

c. Relevance to Enterprise Social Network Analysis

The successful adaptation of CHI methodology from proprietary Lithium communities to Reddit's public ecosystem validates its applicability to our Viva Engage research objectives. Key insights include:

1. **Scalability Across Platforms:** The framework's mathematical foundations prove robust across different social media architectures, from enterprise-focused platforms to public forums.
2. **Predictive Capability**: The distinction between diagnostic and predictive factors provides sophisticated early-warning capabilities crucial for proactive community management.
3. **Normalization Techniques:** The mathematical approaches for handling diverse community sizes, ages, and purposes directly address challenges inherent in enterprise social networks.
4. **Actionable Intelligence:** The framework's decomposition into specific factors enables targeted interventions, essential for HR and leadership teams managing diverse organizational communities.
5. **Democratic Validation Integration**: The Reddit implementation's use of voting systems as quality indicators suggests potential applications for incorporating similar peer validation mechanisms in enterprise contexts.

The Lithium CHI framework and its Reddit adaptation provide both theoretical foundation and practical validation for developing AI-augmented community health assessment tools. Their demonstrated success in creating industry-standard metrics across different platforms strongly supports our objective

of establishing comprehensive community health frameworks that deliver measurable business value while fostering healthy, inclusive digital workplace communities. This literature establishes clear precedent for our approach of using public social media data (Reddit, GitHub, StackExchange) to simulate enterprise social network dynamics, while providing validated mathematical frameworks for community health quantification that can be adapted to Viva Engage's unique characteristics and organizational requirements.

3.3. Data Collection

Reddit emerged as the platform of choice, for it provided a content structure that closely resembled that of Microsoft Viva Engage. With its threaded comment sections that offer insight into thread depth, vast diversity of topics ranging from shared interests to knowledge exchange, and publicly available API, Reddit offered a wealth of data to simulate the behaviour of ESNs as seen on Viva Engage. Another benefit of using Reddit was the ethical alignment it offered- with anonymised usernames, the confidentiality of creators was preserved, while meeting our research imperatives.

The process of subReddit selection involved careful selection of content that closely mirrored that of Viva Engage's in purpose and theme, such as Employee Resource Groups, Knowledge Sharing communities etc. (previously discussed). Care was taken to also identify subReddits with poor performance, or 'dead subReddits' in order to validate our approach and bring the contrast between healthy and unhealthy subReddits into sharper relief.

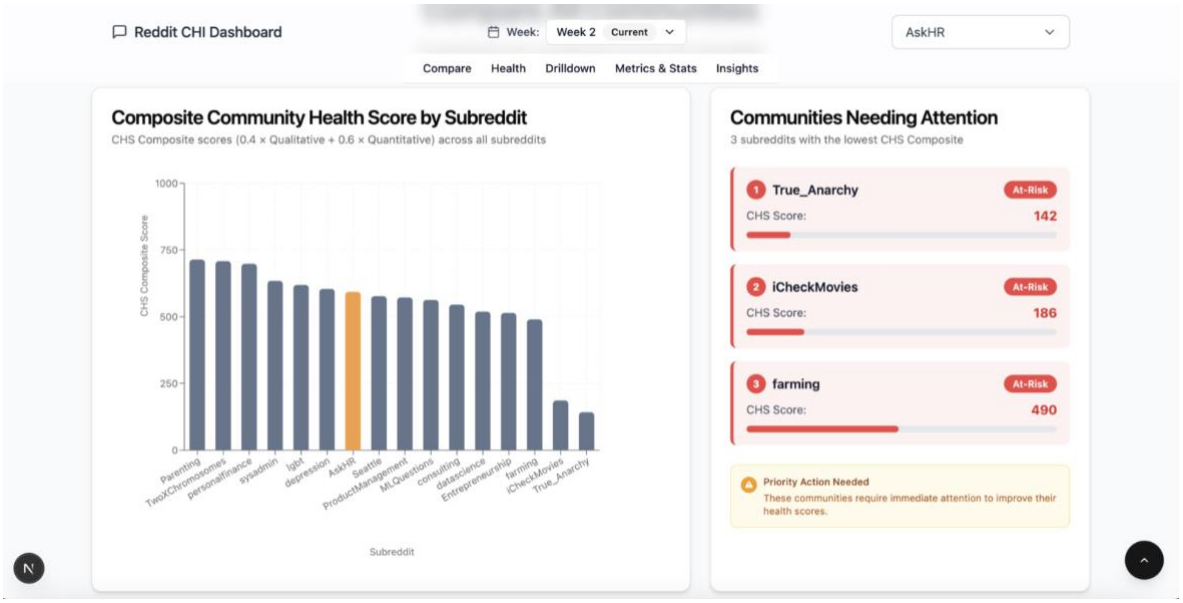
We used PRAW, or Python Reddit API Wrapper, a Python library that enables interaction with Reddit's API. It is an open-source library, free to use for developers to build applications using Reddit's data. Data was scrapped from the 16 selected subReddits on various attributes relevant to our CHS formula, namely subscription numbers and growth, upvote-downvote ratio, comment volume and thread depth. The qualitative analysis analysed the content of the posts and comments to assess sentiment and attributes like empathy, helpfulness, civility.

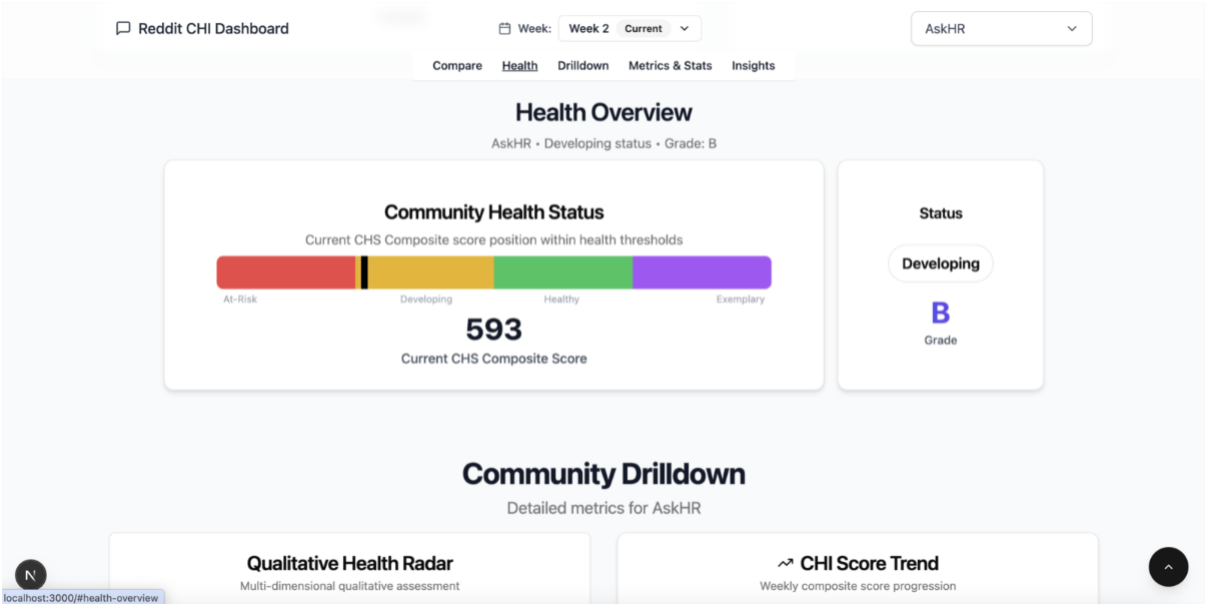
To examine trends, data was scraped at two points: July 17, 2025 and July 25, 2025 in order to study changes over time. Due to paucity of time, the researchers were unable to gather more data at more regular intervals, however, this presents an exciting opportunity for subsequent research to explore automation of data gathering at regular intervals to analyse trends over time.

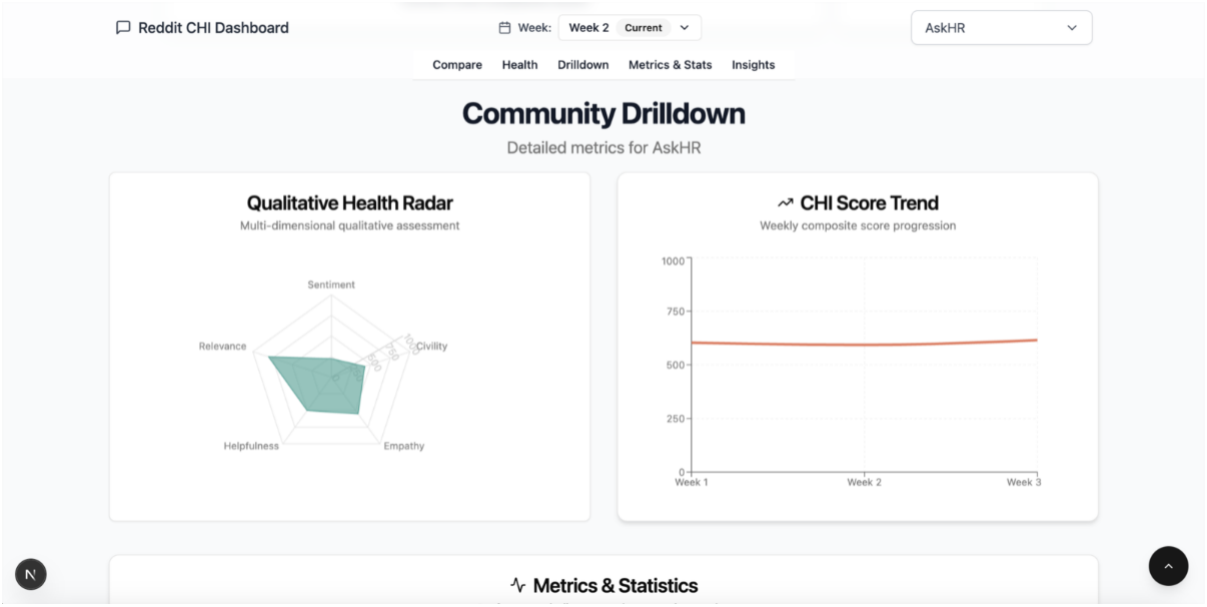
Using PRAW, we were able to scrape top 100 posts from the selected subreddits. The data scraping yielded two CSV files: one that provided a snapshot of the post's creator's user ID, date posted, upvote-downvote score, post ID, comment ID and the content of the post itself. The second CSV yielded information on post specifics that the researchers deemed important to study- such as number of comments (signifying thread depth), number of *unique* comments, upvotes, downvotes, and whether the post invited moderator action.

Scraped data was thus prepared for both quantitative and qualitative analysis.

4. Results






Reddit CHI Dashboard
Week: Week 2 Current
AskHR
Compare Health Drilldown Metrics & Stats Insights
Community Drilldown
Detailed metrics for AskHR
Qualitative Health Radar
Multi-dimensional qualitative assessment
Sentiment
Civility
Empathy
Helpfulness
Relevance
CHI Score Trend
Weekly composite score progression
1000
750
500
250
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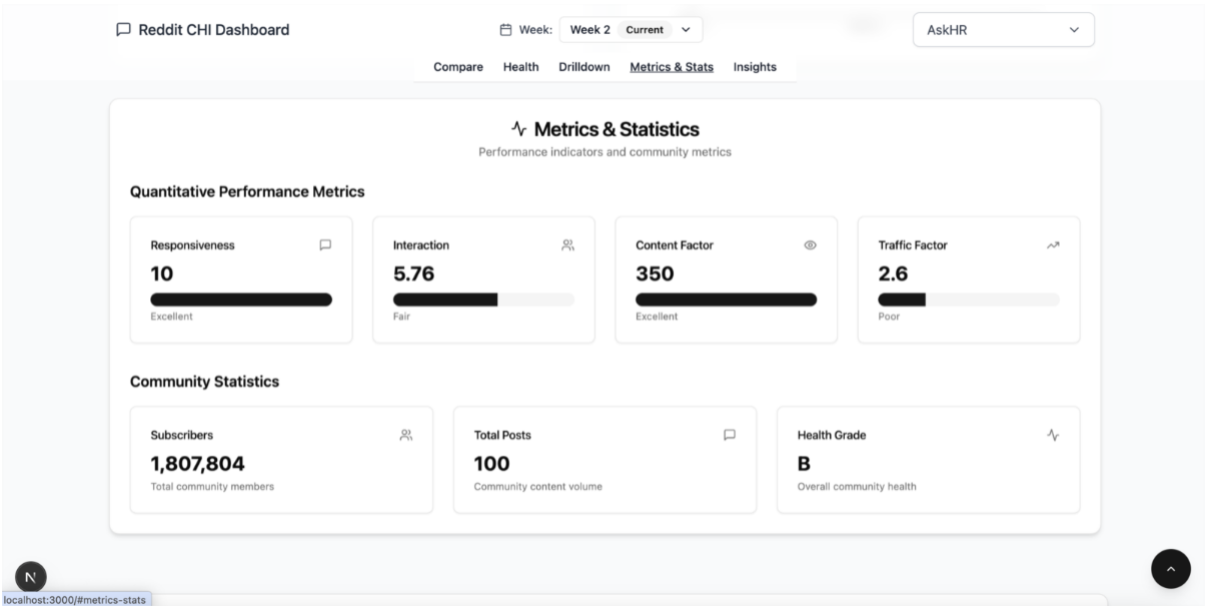
Week 1
Week 2
Week 3
Metrics & Statistics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Metrics & Statistics
Performance indicators and community metrics
Quantitative Performance Metrics
Responsiveness
10
Excellent
Interaction
5.76
Fair
Content Factor
350
Excellent
Traffic Factor
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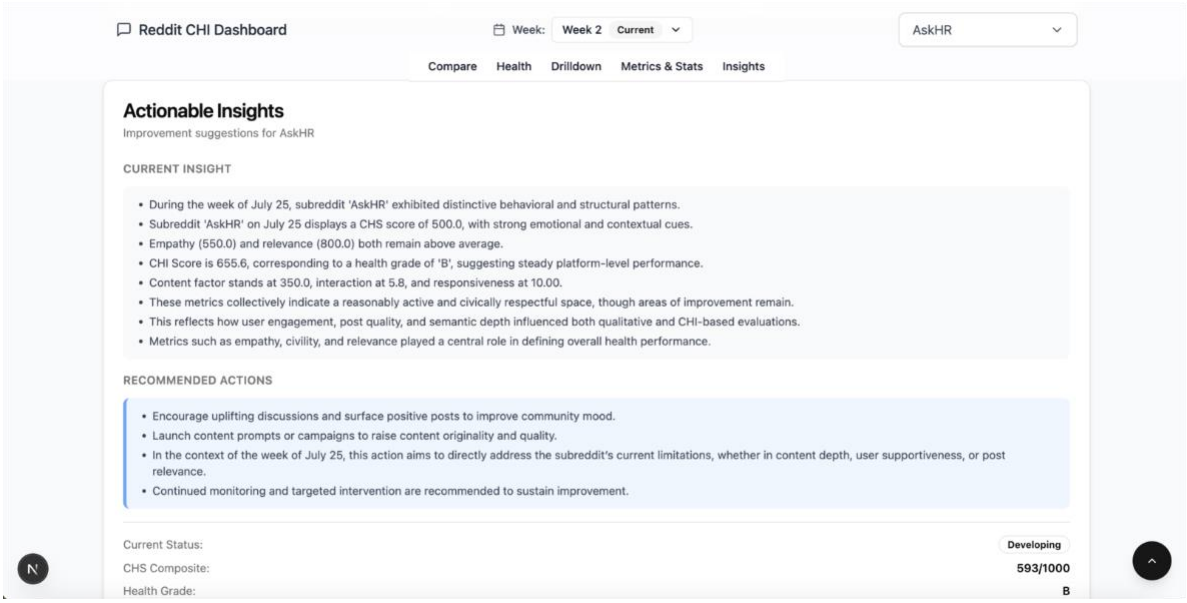
Total Posts
100
Community content volume
Health Grade
B
Overall community health
localhost:3000/#metrics-stats



Our Community Health Score (CHS) framework, combining quantitative engagement metrics with LLM-powered qualitative assessments, successfully identified both strengths and weaknesses across simulated enterprise communities.

a. **Content Quality as the Primary Driver**
   Across multiple communities, improvements in semantic depth, post utility, and relevance strongly correlated with CHS gains. For example, r/AskHR gained +7.64 CHS from a +4.60 Content Factor increase, reflecting more structured, actionable posts. Conversely, r/lgbt maintained high activity levels but saw a Content Factor drop (-2.5), indicating reactive rather than constructive participation.

b. **Tier Movement and Health Shifts**
   Between July 17 and July 25, several subreddits advanced tiers due to increased civility and relevance, while others regressed despite stable or rising activity. For instance, r/Entrepreneurship dropped from Healthy to Developing, driven by significant declines in civility and empathy scores.

c. **Engagement Saturation**
   Findings reveal a ceiling effect: communities with maximum Responsiveness and Interaction scores may still remain non-healthy if lacking empathy or semantic value. This supports the notion that volume-based metrics alone are insufficient for sustainable community health.

d. **Detecting "Pseudo-Active" Communities**
   The combined CHS model effectively flagged communities with high post volume but low emotional connection or topical alignment. r/depression, for example, exhibited high activity but low civility and empathy, leading to reduced CHS.

For instance, r/Entrepreneurship experienced a notable decline in community health between July 17 and July 25, with its CHS dropping from 512.5 to 370.0, shifting its status from Healthy to Developing. While empathy scores improved (+175), significant decreases in helpfulness (-437.5) and relevance (-337.5), along with declines in sentiment (-62.5) and civility (-50), collectively drove the overall CHS

qualitative score down by 142.5 points. Similarly, r/datascience saw its CHI decrease by 11.40 and its health grade drop from B to C during the same period. Despite gaining 1,203 new subscribers, the community experienced a sharp drop in content factor (-31.83) and a reduction of six posts, indicating that increased membership alone did not translate into healthier engagement dynamics.

Subreddit	CHS (7/17)	CHS (7/25)	Health Status
r/Entrepreneurship	512.5	370.0	Health → Developing

subreddit	Normalized Sentiment	Normalized Civility	Normalized Empathy	Normalized Helpfulness	Normalized Relevance	CHS qual
R/Entrepreneurship '17 → 25	-62.5	-50	175	-437.5	-337.5	-142.5

Subreddit	CHI Change	Subscribers Change	Member Factor Change	Content Factor Change	Post Change	Health Grade Change
r/datascience	-11.40	+1203	+0.0002	-31.83	-6	B → C

These results demonstrate that our modular CHS framework can differentiate between truly healthy communities and those with superficial engagement, providing actionable insights for targeted interventions.

5. Discussion

The objective of this research was to uncover insights about online community health, optimal funcitoning and early warning systems using simulated enterprise social networks like Reddit. Our analysis helped glean several insights about online communities, which are detailed herewith:

5.1. General overview and macro-insights:

At the outset, this research and analysis show that the health of an online community is indeed measurable. The intuitive yet abstract notions of community vibrancy, helpfulness and vitality are crystallized into tangible, measurable metrics, which can inform strategic interventions.

Ghost posts, or posts with no subsequent comments, emerged as early warning signs of communities on decline. Even when number of posts remained high, the lack of engagement in the form of comments and shallow thread depth became indicative of declining vitality of the community. This shows that simply monitoring number of posts is not enough to get an accurate read on the health of the community, these numbers need to be backed by a quality check on the content.

Our research also successfully tested the capability of LLM models in automating and scaling moderator activity, by successfully identifying civil, empathetic behaviour and flagging toxicity and irrelevant/ unhelpful content. This is a key finding for not just Viva Engage managers attempting to monitor their online community's morale and tone, but also for moderators of other social networking platforms who may be relying on human moderators to comb through posts and take action swiftly. A note of caution

does need to be sounded in training the model to be bias-free, lest the goals of moderation spill over to censorship.

Since this research chose a wide variety of subreddits, each signifying the different roles played by ESNs, the metrics used to gauge their health need to be thoughtfuly adapted. While our research assigned weights to metrics consistently across the subReddits, future research could explore assigning more weight to, say, empathy and civility in a subReddit like r/Depression, than in a subReddit like r/MLQuestions. Similarly, knowledge-based communities could assign greater weightage to metrics that speak to the helpfulness of the content, than to empathy and civility.

Adaptation is not only required at the community level, but also at the level of the social platform. While ethical considerations of privacy informed our decision to use simulated discussions from Reddit, it should be noted that while a close match, Reddit discussions cannot emulate the unique characteristics of Viva Engage fully. Some dimensions of discussions on Viva Engage might yet be unexplored by Reddit content, such as hierarchy, office politics and corporate culture.

Finally, the research offers the key takeaway that community health is predictable and actionable. Managers can step in to revive communities the minute they see an uptick in the number of ghost posts, few or slower replies, and declining unique contributions, thereby preventing the community's collapse. Managers can also leverage their insights into community health to drive larger organization-wide KPIs: churn rate, onboarding rate, leadership diversity and inclusion scores to name a few.

5.2. Data Drilldown: Micro-level insights:

Analysis of the CHI scores reveals the primacy of content quality on score improvement. The Content Factor in CHI calculation emerged as the dominant driver of improvement in community's CHI scores. For instance, r/AskHR saw a gain in nearly 8 points in the span of a week, primarily driven by improvements in the quality of content- with posts being deemed more relevant and structured, the asks being more tangible and useful, such as interview preparation and resume review. r/personalfinance also saw an albeit smaller improvement of 0.66 points on the CHI driven by improvements in content quality- with posts fetching longer, more involved responses yielding better scores than short opinion polls. This strongly suggests that healthy communities thrive on not just frequency of activity, but also on the quality of interactions and subjective satisfaction over the helpfulness of content.

It was also noticed that Community Health Scores became more balanced over time- likely with improved moderation and civility. However, this finding could benefit from analysing data from more number of periods, to see if this balance holds with addition of posts over a greater period of time. While the analysis shows large gains in CHS scores for many communities like r/TwoXChromosomes, r/Entrepreneurship and r/TrueAnarchy, curiously these gains did not translate to an improvement in their health status, with their status being 'At Risk'. This could point to surface level changes over the span of a week- with enhanced civility and and relevance driving up the score, but not the health status. This is consistent with the design of the formula, which ensures that improvement in a single metric alone cannot unevenly influence the overall score altogether. While civility and relevance are important metrics, they cannot capture the entirety of a community's health. For a community to improve its performance from 'At Risk' to 'Healthy', it must show an improvement across all metrics consistently.

The subReddits flagged for most concerning performance include r/Entrepreneurship and r/TrueAnarchy. While r/TrueAnarchy was an overtly poor subreddit chosen by design, it is illuminating

to see how seemingly active subReddits like r/Entrepreneurship perform at a granular level, with content becoming more off-topic and divisive. Similarly, r/datascience showed a concerning drop in CHI score by 11 points, driven by a drop in its content factor performance. This finding is mirrored in the performance of r/lgbtq, where activity frequency and engagement is high but content factor scores are low, raising questions on interaction quality. These findings shaped the overarching view of the research that content quality is a an undeniable powerful force mediating the health of online communities.

5.3. Recommendations

The measurability and predictability of online community health makes strategic interventions for its enhancement possible. Some of the recommendations for leveraging the CHI and CHS include:

1. Leveraging AI for tone coaching and civil discourse: Instead of a reactive moderator action that results from a tone and civility transgression, leverage AI models to build in tone improvement suggestions, to prevent said transgressions from occuring in the first place. This would reduce the burden of tone and civility monitoring from the moderators, create an overall respectful environment and allow discussions to flow in a psychologically safe environment
2. Community Health Tier Labels: Offer diagnostic labels to different communities and develop customized playbooks for curative action, including tier-specific nudges, content templates and onboarding kits
3. Activate Early Warning Systems protocols: Set pre-determined levels of engagement, unique posts, civility score thresholds, below which the early warning system protocols gets triggered adn alerts the manager/moderator
4. Adapt metric evaluation to better respond to needs of a specific community: Adjust the weightage of different metrics like content factor, civility score etc to reflect the core values and priorities of different communities. For instance, r/Depression could be analysed with greater weights assigned to empathy and civility, while r/Entrepreneurship could assign greater weights to the content factor

6. Conclusion

This research was conceived out of a necessity to monitor health of online enterprise social network, Viva Engage, to determine areas and timing of intervention to ensure that it remains a vital healthy and vibrant space for employees to share their knowledge and feel valued at the workplace. Our research aimed to break down an abstract question: what makes online communities healthy? into simple, measurable components and validate the performance of different online communities on these measurable parameters. The research also sought to explore scalable solutions for moderation of the subjective parameters of content quality in online communities, for which LLM based sentiment analysis was employed. This quantitative and qualitative analysis yielded the conclusion that healthy online communities are characterised by more than just the metrics that meet the eye, like engagement frequency and number of users. Online communities thrive when there is sincere and open exchange of relevant knowledge in a civil and welcoming environment. Our research also helps flags early warnings such as ghost posts and declining engagement for moderators to intervene swiftly, to create resilient and engaged employee communities. The analysis lends itself well to be developed into a dashboard, that can be leveraged by managers for quick real-time updates. While this research uses simulated ESN discussions in the form of Reddit's online communities, the researchers acknowledge that the best

accuracy would be possible by studying a live community in Viva Engage, to fully capture the characteristics of an ESN at the workplace. Future research would benefit from automating data collection at regular intervals to accurately guage trends, and by expanding focus on employee wellbeing themes such as burnout, psychological safety at the workplace, and personal growth.

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