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Executive Summary

This report provides an overview of some ‘peer production’ or ‘crowd-sourcing’ sites in terms of aspects which are relevant to Work Package 3 (Data Quality, Incentives, Gamification, Governance, Users). The document focuses on three well-known sites which are taken as exemplars of different modes of information resource production: Wikis (Wikipedia), Question & Answer sites (Stackoverflow), and Social News sites (Reddit). In addition, the report describes some ways in which other sites operating in these spaces vary their approaches to the aspects listed above.

Further sections describe a site which employed more complex data quality assessment mechanisms (Newstrust.net), and explore examples of sites which encountered difficulties in their approach to data quality (Digg, Your Freedom, America Speaking Out). The report relates all of this material back to the Wikirate Project’s specific aims and established approaches – and concludes with a set of recommendations for the Wikirate Project.



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1 Introduction

This report provides an overview of how some well-known websites deal with issues of data quality, user motivation, gamification/incentives and governance. The intention is to describe the approaches adopted on these sites, consider their strengths and weaknesses, and how they might be adapted to meet the needs of Wikirate.

Four types of site will be considered (Wikis, Q&A sites, Social News, User Reviews and finally a site which is dedicated to assessing the quality of journalistic information). For each type, a well-known example (for which research exists) will be described – along with notes about how other sites of a similar type vary their approach.

With regards to user motivation, incentives (T3.2) and gamification (T3.3) there is an important distinction to be made between ‘intrinsic motivation’ (doing something because it is inherently interesting or enjoyable) and ‘extrinsic motivation’ (doing something because it leads to a separable outcome). There is a body of literature which documents a decrease in intrinsic motivation when external rewards are offered for completion of a task (Deci, 1972; Deci & Ryan, 1999).

This is generally demonstrated through an experimental ‘free choice’ paradigm where participants complete some task (e.g. solving puzzles) in a between-subjects design - with participants in one condition receiving payment and those in another condition not receiving payment. After this initial session participants are then left alone with the experimental task and some distractor tasks for a set period of time and monitored, those who received payment for completing the task tend to spend less time working on it in the ‘free choice’ time period than those who received no payment.

The dominant theoretical framework employed with this research is Self-Determination theory (Deci & Ryan, 1985) – under which the innate needs for competence, autonomy, and relatedness are central to intrinsic motivation.

There is variability in the manner which external rewards interact with intrinsic motivation (Deci & Ryan, 1999). In a meta-analysis covering 30 years of this research Deci & Ryan (1999) found that rewards which are engagement-contingent, completion-contingent and performance-contingent¹ undermine intrinsic motivation. Rewards which are themselves tangible (e.g. money) or expected (i.e. participants know the criteria for award) also undermine intrinsic motivation. However, ‘positive feedback’ (an intangible reward) was found to enhance intrinsic motivation, and unexpected rewards did not generally interfere with intrinsic motivation.

¹ **Engagement-contingent:** reward for participation in task

Completion-contingent: reward for completion of task

Performance-contingent: reward based on performance on task



It is not yet clear how novel on-line rewards such as ‘badges’ (Antin & Churchill, 2011) or ‘reputation points’ are perceived by users and how these affect intrinsic motivation. This will be considered further below.

2 Wikis

2.1 Wikipedia

User behaviours: Edits to articles, discussion on talk pages

The edit action is fundamental to all Wikis, it is the predominant method through which users participate and through which the resource is produced. Edits can however be broken down into different types (adding content, correcting spelling/grammar/formatting, inserting ‘flags’, rolling back vandalism edits) and there is a tendency for users to specialise in the types of edit they contribute with (Welser et al., 2011).

As with many other ‘peer production’ (Benkler, 2006) efforts, the distribution of actions between Wikipedia users is highly skewed and approximates a power law (Wilkinson, 2008). Power law distributions are also known by the “80-20 rule” (in this context suggesting 80% of the actions come from 20% of the users) or by their distinctive “long tail”. Wikipedia founder Jimmy Wales at one point described a distribution of edits whereby the 2.5% most active users accounted for 50% of all edits –leading to the misconception that Wikipedia is ‘produced’ by a small group of 500-1000 key contributors.

Subsequent research has explored the production of Wikipedia and found that much article content is contributed by casual users who make a small number of edits - but each edit might provide a paragraph or more of high quality text that is retained in subsequent versions of the article. Seth Anthony (2006) and Aaron Swartz (2006) explored small samples of articles and both found that casual users accounted for a high proportion of retained article content.

“Only about 10% of all edits on Wikipedia actually add substantive content. Roughly a third of those edits are made by someone without an account, half of someone without a userpage (a minimal threshold for considering whether someone is part of the “community”). The average content-adder has less than 200 edits: much less, in many cases.” (Anthony, 2006)

The counter-point to this is that many of the edits by administrators or heavy users represent ‘janitorial’ work like changing the format of information such that the site has a consistent feel between articles (Anthony, 2006). In fact Wikipedians refer to becoming an administrator internally as “taking up the mop”².

Kittur et al. (2007a) also document trends over time (2001-2006) whereby much of the workload on Wikipedia shifted from ‘elite’ to ‘common’ users.

² <http://en.wikipedia.org/wiki/Wikipedia:Administrators>



Data Quality:

Edits are again fundamental to Wikipedia's approach to data quality. A strong and comprehensive set of guidelines exist which dictate the type of content which should be included in articles and how this should be formatted³⁴. An edit to an article should conform to the guidelines for articles, and this gives Wikipedia's users and administrators a clear mandate as to whether a particular edit should be retained, reverted, or refined. There is also an article quality review procedure and the articles which match these criteria most closely are selected as 'featured articles' - these articles embody Wikipedia's article quality criteria and are shown on the site's home page as a demonstration of their realisation.

There are guidelines and processes for every conceivable aspect of Wikipedia's operation - from a set of guidelines on how to write a guidelines page, to formalised social processes for the appointment of administrators⁵. Wikipedia has now a highly developed and complex bureaucratic system – this is based on the principle of requiring consensus to make changes to official guidelines, policies or processes.

The edit-oriented wiki platform requires consensus and/or strong guidelines to facilitate productive user contributions. As a technical platform, wikis struggle with controversy, differences of opinion and manipulation by vested interests. Where two opposing factions disagree on what an article should say, an 'edit war' can break out.

There have been several reported incidents where opposing groups tried to gain control of pages important to their cause so that they could use them to shape public opinion in their favour. For instance, it appears that pro-Israel and pro-Palestine groups have in the past organised in attempts to ensure that Wikipedia was telling their side of the story on pages relating to controversial issues like the Palestinian right of return (Snydar, 2008). Wikipedia has also in the past banned whole IP address ranges used by the US House of Congress (WebProNews, 2006) and the church of scientology (Singel, 2009) because editors from these locations were manipulating Wikipedia to serve their own purposes.

The resolution of conflicts rests on social rather than technical processes. Consensus is again important with regard to differences in opinion, ideally the conflicting parties should reach a compromise on an article's 'talk page'. A user can also issue a 'request for comment' to bring the issue to the attention of other more established Wikipedians. Where this fails, Wikipedia resorts to hierarchical authority – an administrator can lock an article to prevent further editing, an arbitration council also exists for the resolution of conflicts between users.

Wikipedia's social and bureaucratic structure has been likened to that of a conventional firm (Loubser, 2008) – this is seen as a departure from its idealistic origins. Kittur et al. (2007b) also report a trend

³ http://en.wikipedia.org/wiki/Wikipedia:List_of_policies_and_guidelines

⁴ http://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style

⁵ http://en.wikipedia.org/wiki/Wikipedia:Policies_and_guidelines



whereby the proportion of edits associated with back-end administration pages (as opposed to articles) has increased over time – suggesting that as the site has grown there is an increasing cost associated with this method of organisation. Additional effort expounded on ‘back-stage’ pages like guidelines also implies an increase in the scope or complexity of these guidelines – which in turn would make it harder for a new contributor to acquire the knowledge they need in advance of making a useful contribution. The number of active Wikipedia editors peaked in 2007 at 51,000 and has been declining ever since, estimated at 31,000 in 2013 (Simonite, 2013).

It is important that Wikirate’s approach to data quality should be able to cope with attempts at manipulation by vested interests and with differences in opinion between users on what constitutes ‘important’ or ‘credible’ information. Ideally, these issues should be handled naturally by users’ everyday contributions - and should not require users to get involved in lengthy dispute resolution procedures.

Wikipedia’s early stages were characterised by dedicated contributors who were involved in an endeavour that they perceived as pro-social and almost revolutionary in nature –accompanied by a slow and steady accumulation of critical mass and a willingness on the part of contributors to become ‘governors’ and spend substantial time working out how Wikipedia should operate.

Wikirate should not rely on access to such committed contributors because it is being developed in a different time, when the concept of ‘crowd-sourcing’ is no longer novel and there are many such endeavours competing for the attention of potential contributors.

A recent paper by Solomon & Wash (2014) explored the concept of ‘critical mass’ through WikiProjects (these are working groups which can be formed on Wikipedia for the purpose of co-ordinating activity on a particular task). The research considered over 1,000 WikiProjects which had been active for five years and looked at how characteristics of the project in the first year related to measures of activity in the fifth year – specifically at whether it was better for a project to have a large number of editors in the first year or a large volume of editing activity. They found that number of editors had a much stronger effect on year 5 edit count - suggesting that it is more important in the early stages to attract a larger number of people than a larger volume of content (edits). They also found that greater diversity among year 1 contributors was associated with more growth later on. They also looked at the importance of power users vs normal users in the early stages and found a surprising effect here - a greater number of edits by power users was associated with a negative effect on number of year 5 edits, whereas more year 1 edits from non-power-users was associated with a greater number of year 5 edits. In the context of WikiProjects, it seems that a diverse array of casual contributors is preferable to a small core of committed power-editors in the early stages of a project.

For Wikirate’s collaborative article writing component there are some aspects of Wikipedia which are instructive. Guidelines should be provided which explain the characteristics of a good article. It would be beneficial for Wikirate to provide a basic set of guidelines on article content and the writing process initially so that early users know how they should participate in article writing. These guidelines could be open to



alteration on the basis of user feedback – and users could take ownership of these guidelines (as on Wikipedia) if they demonstrate an appetite to do so, but Wikirate should not assume that this will occur.

The use of ‘flags’ to highlight article aspects that require work could also be emulated – this has a further advantage of breaking the complex task of writing an article into more granular chunks that are more amenable to crowd-sourcing.

User motivation:

The motivations of Wikipedia editors have been the subject of a considerable volume of research. This report will not consider the literature in depth but rather extract some general points about Wikipedians’ motivations.

Schroer & Hertel (2009) surveyed heavy users of the German Wikipedia and found utility in combining two models relating to task characteristics and participation in conventional social movements. Users’ intrinsic motivation is harnessed through a task which engenders a feeling of competence. Users make autonomous contributions and receive (often indirect) feedback from other users on the value of their contributions - they demonstrate and share their knowledge and the related feeling of self-efficacy feeds into their intrinsic motivation for the task.

Schroer & Hertel (2009) also found utility in viewing Wikipedians’ motivation through the lens of voluntary participation in social movements. Here the key aspects of motivation are identification with the goals of the endeavour and a belief that those goals are achievable.

Yang & Lai (2010) conducted another questionnaire study with editors of the English-language Wikipedia which quantified the importance of conventional and self-concept motivation. Self-concept motivation posits a set of traits, competencies and values which an individual perceives that they have (perceived self) and another set which they would like to possess (ideal self). Self-concept motivation arises through an effort to move the ‘perceived self’ closer to the ‘ideal self’ either in the individual’s own perception (internal self-concept motivation) or in the perception of others (external self-concept motivation). Yang & Lai (2010) found that internal self-concept motivation, closely tied to self-efficacy, was the strongest motivational factor among Wikipedians. External self-concept motivation was found to be a very weak factor, suggesting that users do not contribute on Wikipedia to influence others’ perception of them – which is to be expected as Wikipedia does little to credit the authors of content.

Another piece of research which surveyed users of Everything2.com (a user-generated writing platform) found that feelings of *belonging* on the site were important for all users. They also found that new users obtained benefits relating to receiving information whereas established users placed more emphasis on providing information (Lampe et al., 2010). Individuals do not arrive at user-generated sites and make an immediate, stable decision about whether or how they will participate. Instead, there are ‘pathways to participation’ through which users begin as readers and may become contributors. For a user-generated website in its very early stages, like Wikirate, these pathways are of particular importance.



On Wikipedia, where a user can only contribute by 'editing', and there are reams of guidelines which dictate the type of edits required – the barrier to becoming a contributor is quite high. If Wikirate is to achieve a high level of user activity and mass appeal it should seek to lower the barrier to entry as a participant relative to Wikipedia - in the interests of converting more 'readers' into 'community members'.

This is of particular importance given the 'expert' nature of the task which Wikirate is setting for its users. In some ways this task is more difficult than on Wikipedia – many individuals have a topic or area which they know well and could therefore make a productive contribution to Wikipedia articles in that area. Wikirate is limiting its scope to CSR-related topics, thus limiting the number of potential contributors who will feel that they have the knowledge to make a useful contribution to article-writing.

The act of submitting a claim, which can then serve as a building-block for article writing, will address this issue to some degree. Many potential users will still feel that they have no claims to add without first searching for information, but it is easier to find a piece of information and submit this as a stand-alone unit than to find it and embed it directly within an article. Splitting the task in this way makes it more granular, and Wikirate should seek further means of breaking the core tasks down into smaller sub-tasks.

The act of assessing a claim's quality or meaning could be dissociated from the act of embedding it within an article. Giving users an intuitive tool through which they can perform these assessments would make the task more granular and also lower the barrier to entry as a participant – the potential user no longer needs to have information to add, they can contribute by assessing a piece of information which another user has added. The act of expressing an opinion or judgment would also likely appeal to a different set of users than those who would be attracted by sourcing information or writing articles.

Incentives and gamification:

The prevalence of intrinsic and internal self-concept motivation on Wikipedia can also be read as a lack of external rewards or incentives. Wikipedia does little to recognise the participation of individual editors, whose contributions are effectively subsumed within (or rejected from) the Encyclopaedic resource. The contributions of individual users are recorded on the edit history for an article but will only be seen there by fellow Wikipedians with an interest in that article's history.

Wikihow is another wiki-based site for the production of 'how-to' guides. In contrast to Wikipedia, the contributors to an article are credited beneath its title and the site records view counts for the articles an individual has contributed to. A Wikihow contributor can also become a 'featured author', in which case a biographical text about them can appear in the site's side-bar.

Wikipedia offers 'badges' for contributing users, but these are handled in a way which is quite distinct from the typical mechanisms on other user-generated sites. 'Barnstar' badges (McDonald et al., 2011) are the most widely known badges which Wikipedia awards. These consist of a customisable image and short textual description detailing why the badge was awarded, and they are awarded from one user to another



through an edit to the recipient's user page. This stands in contrast to the automatic award based on set criteria (e.g. awarded for making 50 edits) which is more usual for online badges.

A recent study by Restivo & van de Rijt (2014) reported an experiment which aimed to assess the motivational impact of Barnstar badges. They randomly awarded a Barnstar badge to 200 users in each of three activity-level groups (91st-95th percentile, 96th-99th percentile, and 100th percentile – by edit count) and observed the editing behaviour of recipients over the subsequent 90 days. Users in the 100th percentile group who received a badge subsequently increased their level of editing activity relative to the control group who did not receive a badge. There was no significant effect on subsequent editing activity for either of the lower-activity groups. However, when the researchers considered user drop-out they found that users in the 91st-95th percentile who received a badge as part of the experiment were actually **more likely to subsequently cease editing activity** (drop out) than those who did not receive a badge.

This can be read in the light of the intrinsic motivation literature referenced above, and suggests that awarding these users a Barnstar badge (an 'external reward') may have diminished their intrinsic motivation to participate on Wikipedia. An important point here relates to the methodology – users in the 91st-99th percentile do not usually receive Barnstar badges, in the study groups none of the users in the 91st-99th percentile who were awarded a badge as part of the experiment went on to receive another badge during the subsequent 90 days. These users were offered a taste of 'external rewards' as part of the experiment but there was no way for them to continue receiving such rewards. These differential effects of Barnstar badges on different groups of users urge caution in the deployment of explicit incentives like badges – and in particular suggest that any incentive scheme should continue rewarding users indefinitely throughout their participation, a situation where it is possible to 'earn all the badges' would likely be damaging to long-term participation levels.

Wikipedia also has a set of 'service award' badges which a user can self-award when they meet the two criteria based on duration of participation and number of edits made. "These awards are unofficial – displaying the wrong one carries no penalty, and displaying the right one does not indicate authority or competence."⁶

Badges appear to be of little consequence on Wikipedia. Any mention of individual users or their contributions is confined to the site's vast back-end 'community pages' which are clearly differentiated from the public-facing article pages. The existence of such pages and awards is likely unknown to most of Wikipedia's readers, and so these awards are unlikely to encourage a reader to become a contributor.

⁶ http://en.wikipedia.org/wiki/Wikipedia:Service_awards



Barnstars [\[edit\]](#)

	The Original Barnstar I'm giving you this barnstar cuz I feel like it. Connortlanagan (talk) 11:28, 9 May 2008 (UTC)
	The Geography Barnstar For all your hard work creating Xth meridian east/ west articles and Xth parallel north/ south articles. ljanderson (talk) 14:34, 31 January 2009 (UTC)
	The Hidden Page Barnstar I award you one for finding Trekphiler 's page for people who always think that "new message" bar is real. Aren't you glad you answered the phone? TREKphiler <i>any time you're ready, Uhura</i> 00:32, 25 February 2010 (UTC)
	The 'Locator-map-creating' Barnstar For creating locator maps in all articles related to the Foreign relations of Pakistan . Thanks :) Mar4d (talk) 11:44, 20 August 2011 (UTC)
	The Special Barnstar For your fine and neutral edits, as far as that is possible. Keep up the great work! WhiteWriter^{Speaks} 14:30, 9 June 2012 (UTC)

Figure 1. An example showing how Barnstar Badges are displayed on Wikipedia user pages.

Wikipedia relies on users making this decision to become a contributor for their own internal reasons. Recognition as a community member is achieved more through co-presence on community talk pages or the 'Village Pump' than through explicit rewards. In fact there are a set of 'social users' who are defined by their high degree of participation on these back-stage community pages (Welser et al., 2011).

In contrast to badges, there are roles on Wikipedia which carry responsibility and presumably a level of prestige within the community. The role of administrator has no formal criteria upon which it is awarded but there is a formal process for requesting the role. Administrators are "expected to have the trust and confidence of the community, however, so requests for adminship from users who do not have considerable experience are not usually approved". This suggests that being known to other Wikipedians through participation on the site (and possibly attendance at events) is important in determining which users will receive special status. The pursuit of such responsibility may be a motivating factor for some users, and the receipt of barnstar badges seems likely to be a natural by-product of their effort to become recognised as a valuable contributor. On Wikipedia the respect and recognition of other contributors appears to be the important factor, with badges being a largely incidental and imperfect method of reflecting this.

Governance:

In principle all Wikipedia editors have equal status and the site is governed through consensus. This 'governance' occurs at a number of levels.

- Edits to articles should conform to the comprehensive set of Wikipedia guidelines, where an edit departs from these guidelines this is grounds for its reversion by any user.



- Where editors of an article disagree on some point which cannot be resolved through reference to official guidelines, they should first attempt to establish a consensus on the article's talk page. Disputing parties can issue a 'Request for Comment' to bring the matter to the attention of other Wikipedia editors and seek their input.
- Where a dispute cannot be resolved through these processes it can be brought before the Arbitration Committee (or ArbCom)⁷. The arbitration committee is sometimes referred to as Wikipedia's government⁸, its members are second in authority only to Jimmy Wales.
- Wikipedia also has Administrators, who have power to perform certain actions which are closed to ordinary editors (e.g. locking an article, banning a user). A formal social process exists through which a user can apply to become an administrator⁹. Administrators sit below Wikipedia's Arbitration Committee in the hierarchy, and ArbCom has the power to remove a user's administrator status. There are guidelines which define how administrators should act, but it is not clear who has the power to change these guidelines (it seems that prominent administrators can veto changes which they do not approve of).
- The procedure for producing 'official guidelines' is complex¹⁰, these guidelines can be written to direct editor activity, but are also sometimes modified to reflect changes in editorial practices. Changes to official guidelines require 'a high level of consensus from the entire community' but it is not clear how this is gauged.

User demographics:

A survey by the United Nations University (Glott et al., 2010) found that "contributors can be split into four approximately equal age-groups: those under 18, those between 18 and 22, those from 22 to 30 and the remainder between 30 and 85. About 23% of contributors have completed degree-level education, 26% are undergraduates and 45% have secondary education or less. 87% are men and 13% women. The survey included users of 22 language editions in 231 countries."¹¹

⁷ http://en.wikipedia.org/wiki/Arbitration_Committee

⁸ <http://en.wikipedia.org/wiki/Wikipedia:Government>

⁹ <http://en.wikipedia.org/wiki/Wikipedia:Administrators>

¹⁰ http://en.wikipedia.org/wiki/Wikipedia:Policies_and_guidelines#Life_cycle

¹¹ http://en.wikipedia.org/wiki/Wikipedia:Wikipedians#cite_note-UNU-M-6



Wikipedia's editors are predominantly young men, and almost half have a university degree or are currently undergraduate students. The gender gap among Wikipedia editors is well known and widely regarded as problematic.¹²

Lam et al. (2011) studied gender on Wikipedia through users' optional self-selection of gender as part of their user profile on the site. They found that 16% of editors were female but only 9% of edits came from female editors. However, Antin et al. (2011) report that 18% of editors in their sample were female and that within the 75% of users who are least active the pattern of participation is similar for males and females – but within the 25% most active users males tended to make more edits whereas females tended to make larger edits.

Lam et al. (2011) examined the consequences of the gender gap on Wikipedia and found that articles of particular interest to males tended to be longer than those of particular interest to females, an indication that the gender gap affects content on the site.

¹² http://meta.wikimedia.org/wiki/Gender_gap



3 Question & Answer Sites

3.1 Stackoverflow

Stackoverflow is a user-generated question and answer site dedicated to programming-related questions. It is a part of the Stack Exchange network, a group of sites which deploy the same software infrastructure to produce independent sites catering to different topics (many technology-oriented, but also topics like Mathematics and English language usage).

User behaviours: Asking questions, answering questions, commenting, voting on question/answer/comment quality, tagging of questions, community editing of content, offering of 'bounties'.

In contrast to Wikipedia, where user contributions are always an 'edit' of some sort, Stackoverflow offers a wide variety of distinct actions to users and the structural relations between these actions are formalised by the site's software infrastructure.

There is again a power law distribution of actions between users (Mamykina, 2011) and a tendency for users to specialise in the type of action they contribute with. Very heavy users predominantly answer questions, new users are more likely to ask questions, and moderate users tend to have more rounded participation profiles (Mills, 2014).

Both sites collaboratively produce information resources - Wikipedia relies on social norms around the 'edit' to co-ordinate production whereas on Stackoverflow this is achieved through the complex interplay of technical systems which are fuelled by user actions.

Data quality:

On Stackoverflow, 'accepted answers', user voting and community editing all play a role in managing data quality. Questions can receive multiple answers, and the user who asks a question is encouraged to accept one answer which is then marked as accepted and shown above other answers to the same question.

Bi-directional (or "up/down") voting is applied to questions and answers, broadly speaking users up-vote good content and down-vote poor content. Down-votes are subtracted from up-votes to produce a score for the question or answer. These scores represent the community's collective judgment of an item, a positive value indicates approval and this can help a user without the requisite knowledge to prioritise or find the better answers to a question. Similarly, when a user searches for questions the score information directs them to the best versions of similar questions.



Scores are also used to determine the display order of answers (beneath the 'accepted answer'), and on certain pages the scores for questions are used to determine their display order. However, the use of voting scores to direct attention is much more pronounced on Social News sites and will be considered further in the relevant section below.

Community editing of content occurs in two ways. Established users can edit content directly as on a wiki (more on this below) – users who do not meet the criteria to unlock this privilege can suggest an edit which must be approved by others before being put into effect.

Questions are tagged to aid navigation, the adding or editing of tags is handled by users - and the capacity to perform tag-related actions are also privileges which must be unlocked. Content can also be flagged as spam or offensive, bringing it to the attention of users with the capacity to delete it.

In brief, community editing of content serves to improve its quality – while tagging and voting serve to aid navigation (tags allow users to find relevant content, voting scores allow the site to show better content ahead of weaker content).

User motivation:

Stackoverflow has become a valued and widely used resource for programmers, it holds 5.7 million answered questions and these are well organised such that a user can easily find relevant questions. This represents a compelling reason for many individuals to come to the site as a reader. There is also an obvious pathway to participation in that a user can easily ask a question on the site if they find that their question has not already been asked or answered – a strong motivation for some readers to create an account and become a contributor, often resulting in a direct benefit to the new user. Once a user has an account there are many ways in which they can participate casually, the asking of a question and acceptance of an answer both represent useful contributions. The action of voting on other questions/answers is also easy to perform and beneficial to the site.

There is also for some users a degree of intrinsic motivation associated with the provision of answers, this being based on the altruistic act of helping another person to overcome a problem they face. The feedback which Stackoverflow collects (the questioner can accept one's answer, other users can up-vote it to reflect their positive appraisals, the number of times the page has been viewed is recorded and displayed) is likely to enhance this intrinsic motivation.

Incentives and gamification:

Stackoverflow has a highly developed and effective approach to incentivising user participation - this is based around reputation scores and badges. Users earn reputation points when their question or answer is up-voted, when their answer is accepted, and when their edit is approved. Users lose reputation points



when their content is down-voted (though not as many as they receive for up-votes), and there is a stiff penalty for submitting content that is flagged as spam or offensive by 6 other users¹³.

The reputation score reflects a user's contributions to the site, all of the means of accumulating points are based on positive contributions and the score itself is a single number which quantifies the user's history of contribution. A user may be motivated by having their answers accepted or up-voted and knowing that their contribution has been appreciated - the reputation score allows them to retain a numerical record of this feedback and add to it over time.

A user's reputation score is displayed prominently alongside questions or answers they submit –along with their name, profile picture and number of badges earned. A user's profile page also gives a comprehensive overview of their activity on the site. There are also reputation 'leagues' which show the users who have gained the most points in a given period¹⁴ - this is similar to a high score table in a game and lends a competitive element to proceedings.

Reputation scores make the record of user's contributions 'portable'. Stackoverflow's users understand the reputation system, even if two users operate in very different areas of the site (e.g. answers relating to C++ or PHP) they can have an appreciation of how much the other has contributed just by considering their score.

Up/down voting to determine scores for content and award points to users is a highly gamified approach to data quality – but Stackoverflow takes this further into the realm of gamification by allowing users to spend their reputation points as a currency and by using them to determine a user's status and privileges.

Users can offer their reputation points as a 'bounty' for the answer to a question. For example, a user might have asked a difficult question but not received any (good) answers - they could offer a 500 point bounty to the user who provides an acceptable answer. The capacity to spend points in this way increases the perception of their value – using them to incentivise other users to produce a desired answer represents a kind of power (similar to the relationship between an employer and freelance employee).

Reputation points also unlock privileges¹⁵. For example, users cannot cast down-votes or create new tags until they reach certain reputation point thresholds. This contrasts with Wikipedia, where the assignment of roles or privileges rests on social processes – on Stackoverflow many 'administrator' privileges are unlocked automatically as the user earns reputation points.

Stackoverflow also offers a comprehensive and well-constructed set of badges for users. These badges are graded as bronze, silver and gold, with bronze badges being relatively easy to earn and some gold badges being extremely difficult to earn. The easiest bronze badges to earn can be thought of as a tutorial of sorts

¹³ <http://stackoverflow.com/help/whats-reputation>

¹⁴ <http://stackexchange.com/leagues>

¹⁵ <http://stackoverflow.com/help/privileges>



– for example a user earns a badge the first time they submit a question and the first time they submit an answer.

Many badges are awarded based on score criteria, for example there are badges which are awarded for questions or answers with a score of 10, 25 and 100 points. The use of score criteria makes the badge system more robust to attempts at gaming it – badges which are awarded purely on activity counts (e.g. submit 10 questions) are easily gamed by users who wish to collect the badge. Badges which have criteria based on quantitative feedback from other users are also likely perceived as more meaningful because they represent not just an action by the user but how that contribution was received by the community.

Research which has explored the motivational effect of badges has often studied Stackoverflow, the site's open data publication policy has been instrumental in this. Oktay (2010) used propensity score matching and a quasi-experimental design to look at user posting behaviour in relation to the 'Epic' badge (awarded for earning 200 daily reputation points 50 times) – finding that posting behaviour dropped off after the badge was awarded, which suggests that pursuit of the badge had previously boosted posting frequency.

Zhuolun et al. (2012) used a similar methodology to consider the effect of 10 badges on user behaviour, comparing activity levels for one week before and after the badge was awarded and using propensity score matching to pair similar users (where one earned the badge and the other did not). They report that earning any of the badges considered is associated with an increased level of activity in the following week. Furthermore, this increased level of activity is not confined to the type of activity which the badge was awarded for (i.e. a user who earns a badge for a high-scoring question is then more active in submitting questions but also submitting answers, commenting and editing content). The apparent discrepancy between this research and that of Oktay (2010) is likely due to the different types of badge being considered – the "Epic" badge is awarded for long-term behaviour, those considered by Zhuolun et al. (2012) were generally earned instantly (i.e. when the user's question reached a score of 10).

A second part of the Zhuolun et al. (2012) study used a panel design to compare the motivational effects of bronze, silver and gold badges – finding that the effect was qualitatively similar but that gold badges (the most difficult to earn) had the strongest effect on subsequent activity levels.

On Stackoverflow the reputation points system incentivises core actions – questions, answers and edits. The badge system is more flexible and can be used to incentivise or recognise very specific patterns of behaviour (e.g. participating in chat, voting on others' posts, offering bounties, editing old answers) in addition to a range of hierarchical badges which relate to core behaviours.

Wikirate can learn a lot from Stackoverflow in relation to the design of badges and reputation systems (if such incentives are to be deployed), there are however some caveats to bear in mind. Firstly, it is likely that the motivational effects associated with badges on Stackoverflow depend on the presence of an active community which can serve as an audience for a user's badge and reputation 'portfolio'. The visibility which this portfolio is afforded on the site (numbers of badges and reputation points accompany a user's name beside all their posts) probably also enhances the motivational effects. Secondly, Stackoverflow's badges



and reputation points sit within a well-designed but complex site infrastructure – any new crowd-sourcing website should not attempt to move directly to such a solution but instead start with a simpler set of core mechanisms which can meet the site’s aims, and then iterate towards a system that produces a more polished resource and which does more to incentivise user participation.

The precise history of Stackoverflow’s feature/reputation/badge development is not known but there are numerous points which appear to be tweaks intended to correct minor problems or refine some process or aspect of community interaction.

Considering the timing of the introduction of badges on Stackoverflow can help to inform Wikirate’s decision about when to introduce explicit incentives like badges. Stackoverflow was launched as a private beta on 31st July 2008 and entered public beta on 15th September 2008 – their public data dump indicates that around 25 different badges were awarded on this date, suggesting that Stackoverflow implemented badges at an early stage. However, it appears that even in private beta the site was well developed and saw a considerable level of user activity. On 15th September 2008 around 4,500 users were awarded the ‘Teacher’ badge (for a user answering their first question with a score of 1 or more), suggesting that around this many users had participated in the private beta.

Stackoverflow now offers around 80 standard badges, indicating that their badge portfolio has been augmented over time. ‘Tag’ badges exist as a separate class of badges, awarded at bronze, silver or gold levels to recognise a user’s contribution in a particular field (as defined by tags, generally a programming language). Tag badges allow the badge system to recognise not only the level, quality and type of a user’s contributions - but also to describe where a user’s demonstrated expertise lies.

The way that Stackoverflow handles down-voting is also particularly interesting, as this kind of negative feedback causes a number of issues on other sites (see reddit.com below). On Stackoverflow down-voting another user’s post costs the voter one reputation point from their own score – this discourages users from voting in a negative manner generally. For a user whose post receives a down-vote the damage to their reputation score is also much smaller (-2) than the benefit gained from up-votes (+5 for questions, +10 for answers). Combining both of these characteristics: down-voting another user’s posts as a means of victimising or punishing them becomes an unattractive prospect.

Governance:

Stackoverflow sits within the Stack Exchange network, was the first Stack Exchange site and remains the most active and well known. All Stack Exchange sites share the same software and approach to governance. The Stack Exchange network is privately owned, and as such its owners exercise the ultimate power to determine the direction of the site’s development. There are several democratic aspects to this governance, although the outcomes of user voting are most often non-binding and instead serve to inform the decision-making of an oligarchy.



At a low level, users (who have reached a certain reputation point threshold) can initiate votes to perform actions related to questions (close/open/delete/undelete) – if the proposal gains the required level of voting support the action is carried out automatically by the site’s software. A similar process applies to edits made by users who have not unlocked the privilege which allows them to edit content directly – their edits are placed in a review queue to be approved or rejected by other users.

Stackoverflow’s users unlock additional privileges as they gain reputation – but there also exists a class of democratically elected moderators, described on the site as ‘human exception handlers’¹⁶. Moderators have all of the reputation-based privileges but also additional power to over-rule user votes and can suspend or ban users from the site. Their main responsibility is to review posts which are flagged as requiring moderator attention. The election process for a moderator involves three phases and lasts 15 days, it mixes up/down voting and a form of proportional representation.¹⁷

Higher-level governance of Stack Exchange sites’ development is informed through ‘Meta’ sites. Each exchange has a Meta site which uses the familiar software and structure but is dedicated to discourse *about* the site – bug reports, observations or suggestions related to user behaviour, and feature requests. Feature requests are unusual in that they are submitted as a ‘question’ post but do not ask a question – these posts receive a ‘feature request’ flair and different norms apply to voting on these posts (i.e. voting should be based on opinion about the feature request rather than the usual criteria). The decision about which features to add is ultimately made by the sites’ administrators, but voting scores for feature suggestions can effectively inform them about their users’ desires.

User Demographics:

Stackoverflow’s users have profiles which they can optionally fill with information about themselves. However, this information is collected in open text fields, making it difficult to analyse. Furthermore, there is no field for sex or gender on the user profile. It can be assumed that all of Stackoverflow’s users share an interest or level of expertise in programming.

Vasilescu et al. (2012) attempted to determine the gender of Stackoverflow users through analysis of first names coupled with location. In their sample of 4,144 users they identified 7% as female, 55% as male, and for 38% of cases no gender could be determined – of the users who were assigned a gender 11% were female. Vasilescu et al. (2012) note that this percentage is much lower than the workforce in computer and mathematical occupations which is 28% female – suggesting that there is some aspect of Stackoverflow activity which discourages female contributors. They also considered the level of activity on the site on the basis of assigned genders, finding that women tend to pose fewer questions, provide fewer answers, stay involved for a shorter duration and earn less reputation.

¹⁶ <http://stackoverflow.com/help/site-moderators>

¹⁷ <http://meta.stackexchange.com/questions/135360/theres-an-election-going-on-whats-happening-and-how-does-it-work?rq=1>



3.2 Quora

Quora is another site which can be described as Question and Answer oriented. It differs from Stackoverflow in a number of ways. Firstly, the site's content is not publicly accessible, an account is required to browse or read. A user can indicate that they also want an answer to a specific question by indicating that they are 'waiting for' an answer (or following the question).

Quora has up/down voting for questions and answers, its implementation differs from most other sites in that voting is not an anonymous activity on Quora. The effect this has on user voting behaviour or on how voting feedback is received is not yet understood, but there are reasons to believe it may help redress some issues encountered with up/down voting systems on other sites (Mills, 2014).

Quora users can also follow other users and receive a 'feed' of questions which the site thinks they will find interesting – thus giving it much more of a social network feel than Stackoverflow. However, this networking aspect is not necessarily desirable for Wikirate as it will tend to work against the establishment of a singular community producing a coherent resource.

Quora does not offer badges to users, but does compile statistics on user contributions. Quora also has a 'credits' concept which is similar to 'bounties' on stackoverflow – users earn points when their contributions are up-voted and they can spend these points to solicit answers from others.

Quora also has a basic tutorial for new users which takes the form of a check-list – when a user completes various actions they are marked off on the list. One of the goals of 'gamification' on Wikirate is the reduction of complexity, Stackoverflow uses part of its badge system to this end whereas Quora's tutorial represents an alternative approach without badges.

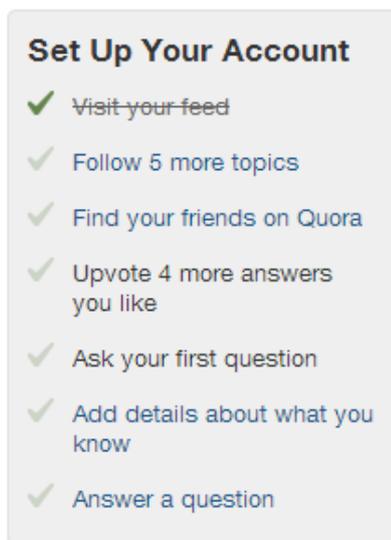


Figure 2. Quora new user 'tutorial'



3.3 Yahoo Answers

Yahoo answers is a Q&A site which has been around for a long time but is generally not regarded with the same level of respect as Stackoverflow and latterly Quora. On Yahoo Answers there is no voting or rating on questions but answers follow the same model as Stackoverflow (up/down voting on answers and the asker can choose an answer which they accept). There is a leaderboard for the users who have accumulated the most points (points are awarded for answering questions and for having answers selected as the best – asking a question actually costs a user points). There are also a limited number of badges (Staff, Top Contributor, Knowledge Partner) of which only the ‘top contributor’ badge can be earned by ordinary users through their participation. These badges are unusual in that their award is temporary. The criteria upon which the awards are made is not published but they are generally believed to be based on recent activity only. A user who stops or curtails their activity on Yahoo Answers will lose any ‘top contributor’ badges they had earned.



4 Social News

4.1 Reddit

Reddit is a ‘social news’ site where users submit content and perform up/down voting on each other’s submissions. Voting scores are used to determine content visibility, with the site’s ‘front page’ showing the highest-scoring recently submitted items. This has the effect of focusing user attention on a very small subset of submissions - the Front page displays 25 posts and accounts for 20% of all page views served by the site¹⁸. Reddit is in some senses a broadcasting platform, with users deciding what to broadcast through voting. This allowed the site to develop and retain a surprisingly strong sense of a coherent community identity while it had hundreds of thousands of active users (although the community has been undergoing a process of fragmentation more recently as the number of active users entered the millions).

User behaviours: Post, Comment, Vote, Create/Moderate subreddit

The distribution of post and vote actions between users is again highly skewed and approximates a power law (Mills, 2014). Users tend to specialise in their manner of participation, users who vote frequently are not the same users who submit posts frequently (Mills, 2014). Users who make a lot of post submissions do not dominate high-attention areas of the site, in fact their submissions tend to perform more poorly. Users who vote frequently have a higher likelihood of success when they submit posts – in many ways it is the voting users who collectively control reddit.

Within voting users, those who vote most frequently tend to vote in ways which are distinct from light or moderate voters. These specialised voting patterns are consistent with attempts to exert disproportionate influence over the voting system – and reddit’s structure is such that it is vulnerable to such manipulation (Mills, 2014), although not to the same degree as Digg, reddit’s predecessor as the largest Social News site.

Reddit is unusual in that the site’s structure develops along ‘democratic’ principles. Subreddits are independent categories or streams of content, users with accounts can choose which subreddits they subscribe to and their reddit ‘front page’ will show the top-scoring recent posts from those subreddits. Any user can create a new subreddit, and many of the subreddits which are currently ‘default’ choices (for new users or those not signed into an account) were created by ordinary users. A user who creates a new subreddit takes ownership of it and has a number of moderator privileges (deleting content, controlling the look of the subreddit, writing a description or guidelines which are displayed in its side-bar). The subreddit’s creator can also nominate additional users to serve as moderators. A subreddit increases and decreases in prominence on the site based on the subscription choices of users.

¹⁸ <http://www.redditblog.com/2012/08/potus-iama-stats.html>



Data quality:

Up/down voting is fundamental to reddit and is intimately tied to content visibility – the key outcome of up/down voting is a score which is used to rank posts and comments, high-scoring content is placed in positions of greatest visibility. Unlike wikis and stackoverflow, on reddit users retain ‘ownership’ and control of their submissions, there is no community editing.

‘Data quality’ is handled with a competitive rather than co-operative approach. Through voting, users promote higher ‘quality’ items to greater visibility while low quality items are pushed out of view. Reddit also differs from Wikipedia and Stackoverflow in that the concept of ‘quality’ is entirely fluid and context-dependant – ‘quality’ is whatever criteria users make their up/down voting decisions on in a given subreddit. There are subreddit-specific guidelines about the type of content which should be promoted but users’ voting often seems to disregard these guidelines.

To take one example, the */r/AskScience* subreddit is intended to facilitate Q&A style dialogue based on scientific evidence – it has strict rules about comments which do not include a source of evidence or which make jokes. When the */r/AskScience* subreddit was added to the set of default subreddits the rate of content deletion by moderators more than doubled - as the subreddit was exposed to new users who did not know about or care for the subreddit’s content guidelines (Mills, 2014).

This example also indicates a more general issue with reddit’s voting system – a bias towards ‘shallow’ content that is easily consumed or entertaining in nature. At every stage, an item of content is in competition with other items – some will be boosted to the next level of visibility, many will fall by the way-side. A piece of content which can be quickly ‘consumed’ allows users to make a voting decision more quickly – it converts views into votes at a faster rate and this gives it a natural advantage. There is also an advantage for content which has a more attention-grabbing title for the same reasons – this confers an advantage on posts which sensationalise their subject, not ideal for subreddits dealing with news of any type.

These issues would also be potentially problematic were Wikirate to deploy up/down voting in relation to data quality.

As reddit has grown, moderators have become increasingly prominent – subreddits dealing with news or other ‘serious’ content increasingly feel the need to enforce their guidelines through deletion. This can be read as a short-coming of either reddit’s voting system or voting users.

On reddit user voting is anonymous and there is no restriction on the number of votes a user can cast (aside from a limit of one vote per item of content). The above issues can be traced back to these characteristics, coupled with the motivations underlying user voting behaviour.

Reddit also applies up/down voting to comments, and uses votes to rank comments and determine the order in which they will be displayed. Reddit’s default comment sorting algorithm is more sophisticated than its ‘Hot’ post sorting algorithm, being based on a Wilson score confidence interval (Munroe, 2009).



This algorithm uses the fact that a comment has both up and down votes to calculate the uncertainty around a comment's 'true' value, and there is tentative evidence that this algorithm is more capable of reflecting the considered opinion of a group of users (Mills, 2014).

The way in which up/down voting handles controversy and differences of opinion would be advantageous for Wikirate. Where a group of users have conflicting opinions about the quality of a piece of content their votes will tend to cancel each other out and the item will quietly be pushed out of view. This contrasts with Wikipedia, where differences in opinion can become foci of user attention and their resolution can require a significant investment of effort on the part of users. Pushing controversial issues or minority opinions out of sight is not entirely desirable for a social 'news' site, but would be beneficial in the context of claims on Wikirate. In this case it would be preferable that only items which are perceived as important by the community as a whole are shown in high-visibility locations. Particularly in the early stages, it is important to focus on areas of consensus between users to allow a sense of community to form – if users' attention becomes focused on issues which are controversial within that community this is likely to lead to a fragmented or divided user-base.

Up/down voting is also relatively robust to manipulation by vested interests – assuming that effective measures are in place to prevent cheating through the creation of 'sock-puppet' accounts. Wikirate intends to invite corporate representatives to participate on the same platform as consumers with an interest in their ethical behaviour – this raises the potential for conflict. It is important that the method of assessing 'data quality' is understood and perceived as fair by all users.

Consider an example of making a decision about the quality of an article which reports horrendous working conditions in a factory making Gap clothing. There is an incentive for the company to resist this article being described as important or credible – using wiki principles, one can easily see this being contested in an edit war or lengthy discussion. If an administrator or 'arbitration council' was required to resolve such a dispute, it would be difficult for such an arbiter to retain the perception of impartiality. Judgments which favour the company could lead to dis-enfranchised users, repeated judgments which favour consumers could lead to the withdrawal of companies.

Judgments which are made through user voting have the potential to allow members of these groups to participate as equals and make collective decisions about data quality without the need to engage in a divisive deliberation or arbitration procedure.

User motivation:

Of reddit's users, the motivation of content submitters is most easily understood. Attention is a valuable resource, and a tremendous volume of attention is available for items which score well. The decision as to which items are placed on the Front page also appears to be based on the merits of the content – there is very little advantage for established users. In a 2-year period between 2010 and 2012, 55% of all posts



observed on reddit's Front page were submitted by a user who only achieved this once (Mills, 2014). The decision-making process is also well understood by reddit users (its mechanisms and algorithms are straightforward), and as it is based entirely on the votes of other users it is generally perceived to be fair. Attention gained for an item by submitting it to reddit is perceived as attention which has been gained fairly.

Youtube is another well-known example of a site with a strong attention economy, and attention has been shown to be a strong motivator for Youtube contributors (Huberman et al., 2009). Views for a video on Youtube act as a kind of currency, and indeed for established users who are invited to participate in the affiliate program views generate real revenue.

In addition to the channelling of attention, up/down voting systems provide quantitative feedback to users who submit content. Even when a post does not progress to high-attention areas of the site, it can still accumulate a score of tens or hundreds of points – this informs the submitter that their post has been seen and appreciated by a certain number of other users.

Early research on up/down voting feedback on Social News sites found that this encouraged users to submit further content and helped users learn to submit better content over time (Halavais, 2009). More recently, questions have been raised over the impact of negative voting feedback. Cheng et al. (2014) describe a spiral of negativity associated with negative feedback – where users who receive this feedback go on to increase their submission rate but make poorer contributions, while also voting more negatively on the submissions of other users, thus percolating the effects throughout the community. However, this research was conducted on professional news sites where user contributions were confined to comments – it is not clear that they generalise to sites which are entirely user-generated.

Both Stackoverflow and reddit now have features which would appear to mitigate such an effect. On Stackoverflow the casting of down-votes is restricted (to users with a certain reputation level) and discouraged (by costing reputation points). On reddit the number of down-votes which a post or comment receives has recently been hidden, these figures were throughout reddit's history openly displayed. Reddit also now closes voting on content after a certain period of time – this change was implemented to circumvent a problem whereby a user who took a dislike to another user could scroll through that user's history down-voting everything to diminish their reputation score.

The motivations of users who vote are not as intuitively understood as those of content submitters. Voting is an entirely anonymous activity, and this precludes any motivation related to personal recognition. However, voting on reddit can be thought of as exercising a degree of power. It is through the voting system that reddit's users decide which items will be displayed to its large and growing audience. The focusing of user attention on the 'Front page' means that placement here is a great prize for an item of content, and it is through voting that users decide which items will win this prize. Voting users are likely motivated in part by a desire to be involved in making a decision which is perceived as important or worthwhile – this effect is enhanced by users understanding of the decision-making process and being able to quantify the impact of their votes.



The voting system itself also has game-like qualities – users click buttons to award points, scores change and items move up and down as a consequence. The scores for items are aggregated to produce ‘karma’ reputation scores for users, so in voting users are also indirectly awarding or removing points from the scores of others.

Reddit does very little to incentivise user voting, but the site has never struggled to induce users to vote. It must be assumed that users are intrinsically motivated to vote. In fact there is an abundance of voting activity on the site, although its skewed distribution between pages means that there are still areas where not enough voting occurs to result in reliable decisions (Mills, 2014; Gilbert, 2013).

Having users who are highly motivated to vote because it represents a form of power is not an unambiguously positive characteristic. There are users who seek to maximise their influence over the collective decision-making process. They do so by voting frequently and quickly, a vote based on 5 minutes of careful consideration bears only as much weight as a vote based on a cursory glance at the post’s title – in March 2009 19.5% of all votes were cast within 10 seconds of the user’s previous vote, 7.6% of all votes were cast within 2 seconds of the user’s previous vote (Mills, 2014). Users who vote in this manner also tend to cast more down-votes, and to vote more on ‘early stage’ pages – reddit’s algorithms and page structure mean that these votes carry much more power than votes cast on content which is already displayed on the Front page. These trends are implicated in the general advantage for content which is easily consumed or has an attention-grabbing title.

The overall effectiveness or prevalence of such strategies on reddit are not well understood, but Digg previously had a similar issue with a secret group (the ‘Digg Patriots’) who could effectively hide liberal-leaning news stories through co-ordinated early voting (Halliday, 2010).

Reddit’s post voting system does not necessarily perform well at judging content quality, but it does effectively distribute power among users. This is the power to decide what is broadcast on the Front page, and the audience for this broadcast is the same group of users (plus many more who read the site passively but do not participate). This forms a feedback loop of attention which has allowed the site’s users to collectively achieve some noteworthy feats. Reddit was instrumental in organising a large scale political rally attended by 215,000 people in Washington D.C. - the ‘Rally to restore sanity and/or fear’. More recently, reddit was at the forefront of raising awareness of SOPA/PIPA and facilitated the organisation of collective action against this legislation (Mills, 2014; Loudon, 2014). The collective action endeavours on reddit were particularly noteworthy for their lack of defined leaders or organisational structure, with the voting system stepping in to serve functions more usually associated with designated leaders (Mills, 2014).

The organisational capacity of reddit’s voting system relies on the presence of comment voting to function. The collective voting decision about a post is unreliable in reflecting quality (poor posts can appear in high-visibility locations) but comment voting reflects the more considered opinion of reddit users. In organising collective action against SOPA, many posts appeared on the Front page which proposed some course of action – when the top-ranked comments on a post were not supportive of the proposal the idea failed to



gain traction, proposals which were pursued by the community and successfully executed had highly-ranked supportive comments which also developed a strategy around the original proposal (Mills, 2014).

Reddit was not designed with this kind of organisational capacity in mind, instead it is a natural by-product of giving users a tool which is easily understood and which enables collective decision-making and a distribution of power among the users.

The focusing of user attention on a small number of Front page items has an additional advantage of generating 'shared experiences' (Sunstein, 2002) for users around which a sense of community can develop. Users are presented with the same set of items on the default Front page, and also share the responsibility for placing those items in that location. The choice of which items to place on the Front page effectively determines the site's identity. When users vote they are indirectly shaping this identity, it is the product of aggregating the votes of all users. Between 2009 and 2011, when reddit had hundreds of thousands of active users but many of these remained subscribed to 'default' subreddits - the site had a surprisingly coherent and strong sense of a single reddit community (Mills, 2014).

Incentives and gamification:

Reddit has a simple 'karma' reputation system which is based on summing all of the scores for a user's submissions and expressing this number as the user's karma score (post and comment submissions are tracked separately to yield two karma scores per user). The precise method in which karma scores are calculated is not known, karma is based on the scores for submitted items but also appears to incorporate some kind of reduction factor. An important point about reddit karma is that posts which receive a negative score do not subtract points from the user's karma score – the worst outcome for a user's karma score when they submit a post is that they earn zero additional karma. This ensures that users will not refrain from posting something because they are worried it will decrease their karma score (but users may still wish to avoid submitting items which score negatively). There may be a further effect whereby this prevents 'troll' users from using karma scores in the opposite manner to that which is intended (i.e. building a negative karma score as evidence that they have successfully trolled reddit's other users). This kind of behaviour has been alluded to by research on Digg (Halavais, 2009).

Anecdotally, reddit users seem to be motivated to increase their karma score, as indicated by the frequency with which discussions around this topic have been observed. Most often, these discussions concern the negative consequences of 'karma whoring' (performing actions for the purpose of accumulating points). Users rarely admit that they seek karma points - it is more common to decry others for doing so.

One can see the attraction of a karma score for reddit users. There is a strong relationship between an item's score and the level of attention it has received - If we assume that users seek attention for their submissions and the appreciation of other users, a karma score reflects both of these facets. Karma scores can be thought of as a crystallised form of past attention/approval gained by the user and expressed in a single number. Once a user perceives their karma score as a reflection of something they care about, taking actions which will increase this score may seem like a logical way to proceed.



The fact that reddit now locks post voting after a certain period of time because users were down-voting old posts to punish other users (by decreasing their karma score) is further evidence that karma matters to reddit users.

Reddit also offers 'awards' or 'trophies' (similar to badges) for users. There are a limited number of these and they are generally quite difficult to earn. They are described only in general terms, the specific criteria of award are usually obfuscated. This obfuscation may be advantageous with regard to intrinsic motivation (which is diminished by 'expected rewards' but not by 'unexpected rewards') – but one suspects that reddit's administrators merely want to avoid giving users further incentive to 'game' the system or participate in un-natural ways.

The key differences between karma on reddit and reputation on Stackoverflow are as follows:

- Stackoverflow maps several types of activity (questioning, answering, editing) unto a single score, with larger rewards for answers than questions. Reddit tracks post and comment karma separately and there is a direct relationship (though not a 1:1 ratio) between an item's score and the contribution it makes to a user's karma.
- On Stackoverflow reputation points have utility – they unlock privileges and they can be used to offer 'bounties'. Reddit's karma scores serve no explicit purpose other than to be displayed on a user's profile.

Governance:

Governance on reddit bears some similarity to Stackoverflow but is in general less nuanced. The site is privately owned and site-wide administrators are employees of the reddit company (formerly owned by Conde Nast, now an independent company with Advance Publications as the largest shareholder). Administrators have the power to change the site's software and add new features, and have in the past occasionally deleted items of content. In the same way that Stackoverflow has Meta exchanges, reddit has some subreddits which are dedicated to user suggestions about changes to the site (e.g. /r/IdeasForTheAdmins) – up/down voting applies to these posts as with all others, and the voting response to posts allows administrators to know whether an idea has the support of users.

Reddit is 'federated' like the Stack Exchange sites in that it consists of independent subreddits. In contrast to Stack Exchange, any reddit user can create a new subreddit and becomes the first moderator of their new subreddit – on Stack Exchange sites the administrators decide when to create a new Exchange (there are Meta areas where users can inform these decisions) and appoint initial moderators of a new exchange until an election is held.

On reddit new subreddits are effectively 'owned' by their creator, who can also appoint additional moderators for their subreddit. A subreddit can be dedicated to any topic or form of interaction, and moderators have freedom to moderate their subreddits in whatever manner they see fit. Many popular



subreddits are now aggressively moderated to enforce their set of guidelines – and there have been many incidents where moderators have been accused of abusing their power (Mills, 2014).

The power of reddit moderators is oligarchical rather than democratic in nature, based on the principle that users can un-subscribe from a subreddit if they do not like the way in which it is moderated. Some subreddits make greater efforts than others to ascertain the wishes of their subscribers and moderate accordingly. There are a relatively small set of ‘power moderators’ who have this status on several of the most active subreddits - and who engage in private discussions about reddit on IRC channels (redd.it/pwle1).

User Demographics:

Interaction on reddit is pseudonymous; users do not have profiles and do not provide their name or any other demographic information, only a username. There have however been several surveys conducted on the site through posts which appeared on the default Front page and were responded to by more than 20,000 users (although this represents an unusual form of convenience sampling).

A survey submitted by reddit user JavalSU in October 2010 received 25,849 responses. 85% of respondents were male, 60% fell into the 18-25 age category, 68% lived in the United States and 83% were of white ethnicity. In total 28% of the sample were white males aged 18-25 living in the United States – if the age bracket is expanded to 18-35 this demographic accounts for 40% of the sample. Users not from the United States tended to live in other English-speaking countries (Canada, UK, and Australia were the next most popular choices). (Mills, 2014)

There are ways in which the demographics of reddit users differ from those of the countries where they predominantly live. 67% of the sample described themselves as Atheist or Agnostic, and in another survey conducted in 2011, 48% of respondents stated they had a Bachelor’s or Graduate degree. The biggest divergence with national demographics is in response to a question about preferred web browser. Reddit’s users predominantly used Firefox (46%) or Chrome (44%), with only 1% using Internet Explorer, whereas StatOwl.com reports that in October 2010, 63% of US residents used Internet Explorer. (Mills, 2014)



5 More complex data quality instruments

5.1 Newstrust.net

Newstrust is a site which aims to assess journalistic quality with a crowd-sourcing approach. It is of particular interest to the present overview because it utilises multi-dimensional rating tools to assess quality, and the performance of these tools has been the subject of research.

User behaviours: Submit stories, rate/review stories, rate reviews, rate users

Data quality:

Assessing the quality of stories and sources is the primary objective of Newstrust. When a user reviews a story they can choose from eight rating instruments which vary the depth and format of the review. The simplest rating involves 3 dimensions (is it factual, is it fair, do you recommend it) which can be responded to with either binary yes/no options or on 5-point scales. The most comprehensive rating format involves 16 dimensions. All ratings can be accompanied by an optional review text if the user wishes.

Lampe and Garrett (2007) assessed the performance of Newstrust users with a variety of rating instruments and measured rating accuracy and user satisfaction with each instrument. The method of assessing accuracy involved a panel of professional journalists choosing a news story published days before the study and making a 'degraded' version of this story which introduced errors and unsupported opinions. Rating instruments were then assessed on their capacity to discriminate between the two versions of the story and accurately review each story (assessed through congruency with expert ratings).

Four instruments were included in this study, the first with a single dimension (overall quality) that was also included in all other instruments. The second instrument included 5 normative dimensions, the third included 7 descriptive dimensions, and the final instrument included all 13 dimensions. The single-dimension instrument had the most power to discriminate between the original and degraded versions of the story, but fared worst on accuracy and effectiveness as perceived by users. The 6-item normative scale was judged to offer the best compromise between user burden and rating accuracy, it offered the closest match with expert judgments.

Writing now in 2014, there are additional questions which one might ask in relation to Newstrust. The site does not appear to have much in the way of user activity, and has not become a 'go-to' resource for those with an interest in the quality of their news. According to research, the site offers rating instruments which perform well and don't over-burden users – so why is it not more popular? In the same time period reddit, which was originally a site dealing exclusively with 'news' content, has shown phenomenal growth.

Part of the answer may lie with the sample studied by Lampe and Garrett (2007) – users who were originally recruited through their membership in an activist organisation and who had already participated in survey studies concerning Newstrust. Perhaps these individuals' perception of what constitutes a



reasonable burden on users does not match that of the general internet-using public. Perhaps being asked to objectively rate the quality of a story is not a task which many individuals feel qualified to engage in.

Review Info Like 21 Logout

Rate this news story:
 Check our new review form – click here

Is this story **factual**?
 Is it **fair**?
 Is it **well-sourced**?
 Does it show **context**?
 Is it **in-depth**?
 Is it **enterprising**?
 Is it **relevant**?
 Is it **well-written**?
 Do you **recommend** this story?
 Do you **trust** this publication?

My overall rating: 3.4

Expand your review

NOTES COMMENTS QUOTES LINKS

Is this good journalism? Why?

Save How to review » | Feedback?

Figure 3. Newstrust.net rating input form



Figure 4. Newstrust.net rating display

Reddit exists at the other end of this spectrum, providing a set of vote up/down buttons but no label or prominent instructions on how these should be used. This makes the site more accessible to new users and diminishes any sense that a user is not ‘qualified’ to participate. It does however mean that it is difficult to interpret the meaning of a reddit score beyond its practical application (“this is attention-worthy”).

If Wikirate is to deploy such systems in relation to data quality the characteristic they measure should be made clear, but in a way which leads users to feel that they are capable of providing useful votes. A good compromise here would be a dimension with a single-word description that invokes a sense of subjectivity (e.g. “Importance”).

Newstrust also allows users to rate the reviews of other users and in fact to review other users directly (these features are unlocked as the user gains ‘levels’). The prospect of having ones’ contribution or oneself reviewed on the site probably does little to encourage a potential user with reservations about their ability to begin participating.



There are other factors which may have prevented Newstrust from establishing a flourishing community. Giving users a number of options for the depth of rating they provide allows them to invest a level of effort which they are comfortable with – but it also detracts from the sense of a shared user experience. Two Newstrust users who provide ratings cannot assume that their experience of doing so is similar. Making the site highly customisable reduces the common ground between users and erodes the foundation on which a sense of community could form.

Newstrust may have a more fundamental problem in that the task it sets for users is more suited to experts than the public at large. This point is of particular relevance for Wikirate. When one considers other sites dedicated to assessing or rating the ethical behaviour/transparency of companies (e.g. EthicalConsumer, CSRhub), these operate on a subscription basis where ‘users’ pay for access to the resource and this funds a team of professionals to generate the resource. A key concern for Wikirate moving forward is to make the process of generating this resource as granular as possible. If Wikirate is to seek a massive user-base it must offer ways in which a user with no special expertise and limited time/effort can make a useful contribution and understand how this contribution fits into the larger process of producing the resource.



6 'Data Quality' pitfalls

There is much to be learned from the consideration of crowd-sourcing endeavours which fail or encounter serious problems. Unfortunately, many such endeavours fail quietly without ever becoming widely known. Recognisable crowd-sourcing efforts are almost universally successful to the point of attracting a large user-base.

There are however some known examples which illustrate various pit-falls which may be encountered by a crowd-sourcing endeavour which aims to empower users to collectively assess 'data quality'.

'Your Freedom'¹⁹ was a website launched by the British coalition government in 2010 which aimed to crowd-source political policy ideas for 'restoring civil liberties'. It serves as an example of a site where user ratings were poorly implemented, failing to empower users to work together or produce a collective appraisal of the ideas which were submitted.

In terms of the site's infrastructure, the five-star ratings which were used did not fit with the page types through which users could browse ideas. Three types of page existed to display ideas, one showing the latest ideas, another showing 'top scoring' ideas, and a third showing ideas which had received the most ratings. The execution was such that the majority of ideas quickly disappeared from all of these page types – an idea would appear initially on the 'new' page but be quickly displaced by subsequent ideas, the 'top scoring' page only showed ideas with an average rating of the maximum 5 stars (therefore an idea could no longer appear here once it received even a single rating of less than 5 stars), while the 'most rated' page was subject to a feedback loop whereby an idea gained more ratings if it appeared there. Ideas submitted on the first day became entrenched on the 'most rated' page and the page became static (Mills, 2014).

Your Freedom lacked a page which could serve as a useful focus of community attention, a place where users could go to see 'what's happening on Your Freedom today, which new ideas have community support'. As a result the site failed to develop any sense of community and was plagued by duplicate idea submissions. The site was intended to highlight the best submitted ideas so that these could be presented to government ministers - it failed in this regard and was shut down after being operational for just a few months.

Given the choice to use 5-star ratings, Your Freedom needed an algorithm which could take into account the average rating but also weight this by the number of ratings which had been made. Up/down voting would have been a more appropriate rating tool for this purpose, as the scores it generates reflect both the level and direction of voting activity. Up/down voting also offered a better conceptual fit in this case, when politicians vote on a bill they either vote for, against, or abstain – which maps neatly onto up/down voting. A further criticism of 5-star ratings in this context is that users who understand how the rating is used and

¹⁹ <http://webarchive.nationalarchives.gov.uk/20100709093439/http://yourfreedom.hmg.gov.uk>



wish to maximise their influence will tend to choose a rating of 1 or 5 stars – a rating of 2 stars is equivalent to saying “I oppose this idea but don’t put too much weight on my opinion”.

Americaspeakingout.com was another site which aimed to crowd-source political policy ideas, it was backed by the Republican Party in the USA. Americaspeakingout used up/down voting for ideas and borrowed the pagination structure of Social News sites. As a result it did successfully give users the power to rate ideas collectively - the problem it encountered was due to the manner in which users joined the site. When Americaspeakingout was launched it received some publicity and a large influx of users who were familiar with the Social News processes it employed but unsympathetic to the Republican party joined the site in its early stages. These users used the voting system to promote ridiculous ideas for the purpose of discrediting and mocking the site (Milbank, 2010). A site which successfully distributes power to users and allows anyone to join is inherently vulnerable to such an ‘invasion’ in its early stages.

On reddit the same phenomenon persists at the level of subreddits, a small community can become swamped with new users if a post submitted there becomes popular elsewhere on the site. This can lead to an instantaneous change in the character of the community as expressed through post and comment voting (in one example a subreddit for LGBT issues suddenly had positive-scoring comments which were anti-gay) (Mills, 2014).

The demise of Digg.com, formerly the largest Social News site, offers a further cautionary tale about the pit-falls of successfully empowering users. In August 2009 Digg launched a major revision to its software infrastructure (‘version 4’). Many Digg users did not approve of the changes made with ‘version 4’ of the website’s software, which were seen as removing power from ordinary Digg users. Immediately following this upgrade Digg’s Front page was filled with items complaining about the upgrade and calling for a reversion to the previous system. In the days that followed, as it became clear that no reversion to the previous software was planned, Digg users began up-voting posts which linked to reddit. This produced an unusual spectacle whereby Digg’s Front page was filled with posts linking to reddit, Digg’s main competitor, for a period of around one week. During this time it is estimated that Digg lost around 26% of its traffic (Lardinois, 2010), while reddit saw a corresponding increase in its usage statistics²⁰. Digg, a company once valued at hundreds of millions of dollars, never recovered from this exodus.

There are previous examples from Digg’s history where the site’s administrators were unable to stop users submitting posts with illegal content (e.g. the encryption keys for the HD-DVD format, Greenberg, 2007) and promoting these posts to high-visibility locations.

Any site which seeks to engage ‘the crowd’ in some task should consider carefully the ‘bargain’ (Skirky, 2008) it offers users. Where a community is effectively given ownership or control of some aspect of the site, they will often react badly when their control is subsequently diminished or interfered with.

²⁰ <http://www.redditblog.com/2010/08/everything-went-better-than-expected.html>



7 Summary

	Wikipedia	Stackoverflow	Reddit	Newstrust
User behaviours	Edit, Talk	Question, Answer, Comment, Vote, Edit, Tag, Bounty	Post, Comment, Vote, Create subreddit	Submit story, Rate/review story, Rate review, Rate user
Data quality	Edit according to guidelines	Up/down voting, Community editing, Accepted answers	Up/down voting, Moderation of federated subreddits	Multi-dimensional 5-point ratings
Motivations	Self-efficacy, Participation in a pro-social cause	Direct benefit (gain answer), Self-efficacy, Recognition of expertise	Gain attention for submitted content, Vote to decide which content receives attention	Weak, Promote high-quality journalism?
Incentives & Gamification	Weak, user-to-user Barnstar badges, Self-awarded service badges, exist only on 'user pages'	Reputation points unlock privileges and can be spent as currency, Badge system is comprehensive, both displayed prominently	'Karma' points, some badges, both displayed on users' 'profile' page	Users and their contributions are rated, profile shows user's rating and activity stats
Users	Young, Male, 47% current/former students	Programmers, Male	Young, Male, White, 48% hold a university degree	Unknown
Governance	Consensus, Deliberation, Bureaucracy, Users with special status (Administrators, ArbCom) selected through formal social processes	High-level decisions made by owners/employees and informed by user-rated suggestions in dedicated areas, Elected moderators with limited remit	High-level decisions made by owners/employees and informed by user-rated suggestions in dedicated areas, Moderators have almost absolute power in subreddits they create	Private

Table 1 summarising key points in relation to four sites considered in this overview.

Three highly successful sites which engage 'the crowd' to produce an information resource (Wikipedia, Stackoverflow, reddit) have been considered. These sites share a number of commonalities. There is a power law type distribution of activity between users, and a tendency for users to autonomously specialise in the type of contribution which they make. Users come to the site initially to read or consume content,



and from that point some proportion decides to start contributing. All three sites were populated with content initially in a way which is distinct from how content is produced on the mature platform. Wikipedia began with a set of articles from the failed 'Nupedia' venture. On Stackoverflow (Mamykina, 2011) and reddit²¹ the sites' developers were its most active contributors for a period of time – giving the sites a sense of activity, demonstrating how they worked, and ensuring that there was some content for a visitor to read.

The users of these three sites are predominantly young males, which raises the question of whether there is something about these forms of production and interaction which discourages female participation. There is no reason to believe, *a priori*, that 'potential Wikirate users' are mostly male – on matters of ethical consumption, awareness or intent most studies report only marginal or modest gender effects (Turcotte, 2010; Batemen et al., 2010; Nielsen, 2013). Wikirate should bear this in mind and try to avoid producing a platform which alienates potential users of a certain demographic.

However, the factors which lead to gender imbalance on the sites which have been considered are not well understood. One possibility is that these sites were initially populated by mostly male users and this becomes a self-perpetuating process where female users are uncommon and therefore the subject of unwanted and unwarranted attention. On Wikipedia, new female contributors are more likely to have their good-faith contributions questioned or reverted than new male users. On reddit, users who identify as female have historically been the subject of unwanted attention or harassment. If the Wikirate project's marketing component deliberately seeks a balanced male/female population of early users, this could potentially avoid a longer-term gender imbalance – or failing that, would allow research to explore other causes for an emerging gender imbalance due to differential drop-out.

There is a further commonality which is of particular relevance to Wikirate – on all of these sites users can contribute based on their existing knowledge, expertise or opinion. On Wikipedia users write articles about topics they know well, on Stackoverflow users answer questions about issues they understand well, on reddit users submit content which they have seen elsewhere (or produced themselves). Reddit and Stackoverflow also allow users to contribute casually by voting without the need to produce or submit anything.

The number of people who will be able to contribute to claim submitting and article writing on Wikirate based on pre-existing knowledge will be extremely limited. For most users, submitting a claim will first involve finding relevant information to submit. Writing good articles is an effortful task and will require a user to first familiarise themselves with the content of claims and assess their importance or credibility.

One of the big challenges which Wikirate will face is in building a large user base, to do so the barrier to entry as a useful contributor must be lowered. Data quality assessment is the task where this can most easily be achieved – clicking buttons to rate the quality or importance of another user's contribution is inherently easier than adding new content. It also involves the expression of opinion, a task which many

²¹ <http://www.dailydot.com/business/steve-huffman-built-reddit-fake-accounts/>



people are intrinsically motivated to engage in, particularly when those expressions serve a clear purpose. The very appearance of gathering this kind of feedback has also been shown to increase users' 'intent to participate' on discussion fora (Wise et al., 2006).

Claims are the obvious place to start in terms of introducing data quality assessment mechanisms. As the site accumulates claims the task of writing a good article will become more difficult if these are simply presented as an undifferentiated list of claims that are relevant to a particular company and topic. Up/down voting on claim 'importance' (could be another criterion) would allow for a number of potentially attractive features. The scores for claims could be used to determine their display order – this would allow users who are writing articles to prioritise important claims without expending the effort to assess individual claims and decide which claims are most important. Claim importance scores could also be factored into citations within articles (e.g. colour-coding the citation to reflect importance score) – this would allow for the article's quality to be more easily assessed (if it relies on weak claims it is probably a weak article, if it excludes important claims why is this the case?).

Up/down voting on claims also raises the possibility of allowing these to stand alone as a 'news' type resource. Reddit's primary use of voting scores (i.e. picking out important recently-submitted claims) could be emulated in some areas of the site. This would have a number of benefits, but also some disadvantages. The main benefit would be in focusing user attention to generate shared experiences around which a sense of community could form. A page which shows claims from the previous 24 hours which the Wikirate community believes are important would show where the community's attention is currently focused, and also help to establish the community's identity. Increased attention for important claims (and an increased chance these will be used in articles) would also increase the motivation for users to submit new claims. Some potential disadvantages of this approach would be that Claims could come to dominate interaction on the site – and that increased visibility for high-scoring claims would artificially stretch the distribution of scores between claims. Claims featured in a high-visibility location would naturally accrue much larger scores than those which were not, and this increased variance would not be helpful in deciding which claims should be used by an article.

The potential advantages and disadvantages of displaying claims in this way would be dependant on the level of prominence afforded to the ranked list and the algorithms used to perform the ranking – both could be fine-tuned to maximise the advantages and minimise any negatives. Up/down voting systems have the advantage of being quite versatile, and their implementation can be tailored through tweaks to the algorithms and pagination structure of the site.

Up/down voting systems have a further advantage in that they do not emphasise controversial content – up and down votes cancel each other out and the item's score does not increase. This is desirable for claim rating on Wikirate, where the focus should be on claims that are perceived as important by the community as a whole. Where the community is divided on the importance or credibility of a claim, citing the claim in an article would extend that 'controversy' to the article and necessitate a potentially difficult deliberation around how the claim should be interpreted in the article. Up/down voting for claims would allow a



consensus about which types of claim are important to emerge indirectly from user voting behaviour – without requiring a lengthy and effortful deliberation procedure. With enough voting users, this kind of approach also appears relatively robust to manipulation by vested interests (who in a more deliberative process could invest more time/effort and thereby potentially exert more influence). This ‘robustness to manipulation’ assumes that users who cheat (through the control of many sock-puppet accounts or co-ordinating their voting activity off-site) can be identified and nullified – a significant but not insurmountable technical challenge.

It is desirable that users engage in discussion about the qualities of claims, to develop a shared understanding of what makes a good/bad claim. The discussion spaces for claims could facilitate this kind of discussion without the time-consuming necessity of deciding whether/how the claim should be used in an article.

Cultivating a large and active user-base, and *the perception of a large and active user-base*, is vital to Wikirate’s success in a number of ways. Up/down voting encourages a large quantity of user actions, and its outputs naturally emphasise the scale of voting activity. The perception that there are many active users on the site establishes an audience, which will encourage users to engage in the more effortful tasks of submitting claims and writing articles. The perception that voting activity feeds into article writing (by prioritising claims) would further strengthen the appeal of article writing – this becomes a process of fulfilling/completing/harvesting the efforts of many claim-voting users and could establish a kind of reciprocal relationship between users who engage in claim submission, claim voting, and article writing.

Prominently displaying values which reflect the scale of user activity on the site has a further advantage in the impression made on potential users who visit the site for the first time. A crowd-sourcing site that a high level of activity is inherently more appealing, and may even lead readers to appraise the value of its content more highly (a claim that has been backed by 100 people carries some weight and cannot be dismissed out of hand without also dismissing the community of users who judge it to be important).

A data quality measure for claims can also be used to inform the appraisal of source quality – high quality claims imply a high quality source. There is potential for the data quality measure to provide a useful input to the automatic source recommendation engine.

This overview has considered several sites which employ bi-directional (up/down) voting, but there is also the option of uni-directional voting (similar to Facebook’s ‘Likes’). Bi-directional voting would be more suited to content which is relatively static and ‘owned’ by an individual (i.e. Claims). Uni-directional voting may be of utility when assessing the quality of collaboratively edited content (i.e. articles) – such content is dynamic and subject to improvements, therefore the capacity to ‘down-vote’ is not necessarily desirable.

The question of how to assess the quality of collaboratively written content is an open one, and there is potential here for Wikirate to conduct research that has broad utility. Wikipedia does not automatically assess the quality of its articles, but rather there are formal social processes through which some users



spend time reviewing article quality and picking out exemplary (featured) articles or inserting ‘warning’ flags for articles which do not meet Wikipedia’s guidelines.

Stackoverflow applies up/down voting to collaboratively edited content but there is an important difference to Wikirate in that the question/answer dyad very quickly reaches a form which is stable and is subject only to refinement. On Wikirate there are a set number of ‘article spaces’ (Number of companies X Number of topics) – most of these are currently blank, and are likely to be developed through a series of relatively small edits in a process that continues indefinitely and sees the article change significantly over time.

Giving users the ability to down-vote such an article or give it a negative rating of any type seems counter-productive – it occupies a space which should eventually contain a high-quality article. Uni-directional ratings could be used, such that users click a button when they think an article is of high quality. The Chinese wiki system *Baibe* collects this kind of uni-directional feedback through a ‘thumbs up’ icon on each article which can be clicked – an article’s number of ‘thumbs up’ is displayed in the header, it is not clear whether this information is used in any other ways by *Baibe*.

An algorithm could be devised which considers the timing and frequency of ‘thumbs up’ or ‘Likes’ and showcases a set of ‘recently improved’ articles, this would allow for a sense of where the community’s attention (both readers and producers) is focused, offer feedback to article contributors, and direct users to articles they may wish to re-read. Naturally occurring activity indicators (number of edits, number of editors, quantity of text added, number of times the article has been viewed) could also be used for a similar purpose – these could reflect where the attention of article writers is currently focused, but would not offer the same level of feedback to article writers.

The key factors here are social – if users were to experience the provision of these uni-directional ratings as an additional burden, then naturally occurring activity indicators should be preferred. If, however, there are users who would like to participate in a casual manner but don’t feel able to submit claims or write articles, then clicking a button to indicate that they like an article would represent another way to engage such casual users in a productive manner.

With regards to incentives (T3.2) and gamification (T3.3), the data quality measures which are adopted will provide powerful inputs – work on the design of incentives and gamification cannot begin in earnest until the range of user behaviours and the interplay between these actions have been established. Stackoverflow demonstrates that up/down voting can form the foundation of a powerful incentive scheme, and there is much to be learned from this site in terms of explicit incentives and gamification.

However, work on an explicit incentives scheme should not be a priority for Wikirate at this juncture. At this stage and in the near future Wikirate will require users who are intrinsically motivated to participate through identification with Wikirate’s goals, and a perception that Wikirate offers an effective means of working towards those goals. As such, a set of core mechanisms, and a demonstration that these



mechanisms can be used as an effective means to produce the desired resource, are of the upmost importance for recruiting active participants.

Further to this, it is desirable that any user who sympathises with Wikirate's goals and would like to contribute can easily find a way to do so productively – there is a danger that users who want to participate may not because they feel they do not have the required expertise or enough time to make a productive contribution. It is important to bring as many as possible of these people in as 'users' rather than 'readers' or 'lurkers'. If evident, their presence and (feedback-generating) activity on the site will encourage others to contribute to more effortful tasks. Wikirate's approach to data quality should aim to achieve this as a secondary objective – cultivating the sense that the website has a large group of active users.

Any scheme of explicit incentives for user participation requires an active community or audience to be effective – the incentive stems from having ones' contributions recognised by peers, the more peers there are the greater the motivational effect. In fact the provision of an 'incentives scheme' (like badges) at this stage could be counter-productive for Wikirate as external rewards can interfere with intrinsic motivation – this is very likely if the incentive scheme is seen as dictating how a user should participate, therefore eroding their sense of autonomy and self-efficacy.

The design and implementation of an explicit incentives system should occur at a stage when Wikirate has an active community following a process which works for production of the desired resource. The value of such a system is in attracting and maintaining widespread participation once the site can demonstrate that it is a place where the goal of promoting corporate transparency can be effectively pursued.

In the design of incentives and gamification elements Wikirate should attempt to avoid rewards which are likely to interfere with intrinsic motivation. The relationship between novel online rewards (e.g. badges, reputation points) and intrinsic/extrinsic motivation is not well understood – is a badge an 'expected reward' when its award is based on quantitative feedback from other users? Or would this fall into the category of 'positive feedback'? Is a badge a 'tangible reward' if it is displayed on a user's Wikirate profile? Does it become a 'tangible reward' if it can be exported to Mozilla's Open Badges Backpack and referenced when applying for jobs?

Where an incentive does detract from intrinsic motivation, it is important that this incentive is available to users on an ongoing basis. If Wikirate were to offer, for example, a set number of badges which can only be earned once, then users who had earned all of these badges would be likely to drop out because their intrinsic motivation had been weakened and external rewards were no longer available. Stackoverflow and reddit have incentives which persist throughout a user's active life-span on the site – most notably their reputation scores, and many of Stackoverflow's badges can also be earned multiple times.

Research conducted as part of the Wikirate project has the potential for broader significance through addressing these questions about the interaction between novel online rewards and intrinsic motivation. Similarly, the question of how to recognise and reward valuable contributions to a wiki-type resource will



be addressed by the Wikirate project's research component and would be relevant to many other crowd-sourcing endeavours.

7.1 Review of key recommendations

- In seeking a large user-base, Wikirate should aim to make the production of its resource as granular as possible – finding ways for casual users, or those who do not perceive themselves as knowledgeable on the subject, to make useful contributions
- 'Data Quality' is the area where casual users can most easily be engaged as productive contributors
- Wikirate should aim to assess data quality in an accessible manner which does not over-burden users, which is robust to manipulation, and which scales up to accommodate many users
- Users will tend to specialise in a particular mode of participation, to build community it is important that users understand how these different modes of participation relate to each other
- Wikirate should in the short term concentrate on core functionality rather than an explicit incentives scheme – at this stage it is most important that potential users who want to promote corporate transparency (intrinsically motivated) perceive Wikirate as a place where they can do so
- Early users of Wikirate will strongly shape the site's perceived identity and purpose
- As features are added to the Wikirate website, Wikirate partners should use these features to populate the site with content – giving visitors something to read, and also demonstrating how the site functions by way of example



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