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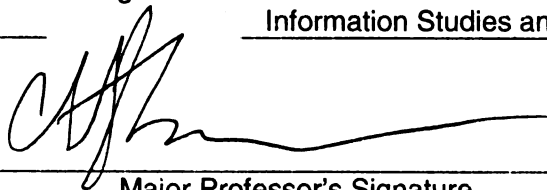
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**WIKIPEDIA AS COLLECTIVE ACTION: PERSONAL INCENTIVES AND  
ENABLING STRUCTURES**

**By**

**Benjamin Keith Johnson**

**A THESIS**

**Submitted to  
Michigan State University  
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## ABSTRACT

### WIKIPEDIA AS COLLECTIVE ACTION: PERSONAL INCENTIVES AND ENABLING STRUCTURES

By

Benjamin Keith Johnson

Wikipedia is an online encyclopedia created by volunteers, and is an example of how developments in software platforms and the low cost of sharing and coordinating on the Internet are leading to a new paradigm of creative collaboration on a massive scale. This thesis addresses the questions of why individuals choose to give away their time and effort and how the challenges associated with collective action are addressed by Wikipedia's technologies, organization, and community. Interviews with editors of the encyclopedia were used to identify what personal gains and other motivations compel contributors, what challenges to collaboration exist, and what technological and social structures aid their ability to create a freely available repository of human knowledge.

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## Wikipedia as Collective Action: Personal Incentives and Enabling Structures

The free, online encyclopedia Wikipedia is among the most prominent of current projects on the Web that harness the distributed efforts of its users to create content online. Since its creation in 2001, Wikipedia (<http://www.wikipedia.org>) has seen immense growth and has been the recipient of both criticism of its quality and reliability, and accolades for its ability to collect and organize an unprecedented amount of knowledge using an open-access model. This thesis is driven by an interest in the question of why individuals are motivated to contribute to Wikipedia.



Figure 1. The multilingual Wikipedia Main Page, with direct links to the 10 largest Wikipedias and a search box below. Further down the page, links are provided to the remaining Wikipedias, sister projects, and the parent Wikimedia Foundation.

Founded by Jimmy Wales and Larry Sanger (which is disputed – Wales claims to be the sole founder and that Sanger was simply an employee) as a supplement to and eventual replacement for Nupedia, an online encyclopedia with a more traditional editorial process, Wikipedia today boasts over 7 million articles in 253 languages (Wikipedia, 2007d), with over 1,864,000 articles and nearly 4,788,000 registered users in the English Wikipedia alone. Wikipedia.org is currently the ninth most popular site on the web (Alexa, 2007), with 36% of online Americans using Wikipedia as a reference (Pew Internet, 2007). Figure 1 is a screenshot of the Wikipedia Main Page and Figure 2 provides a view of the Main Page for the English Wikipedia.

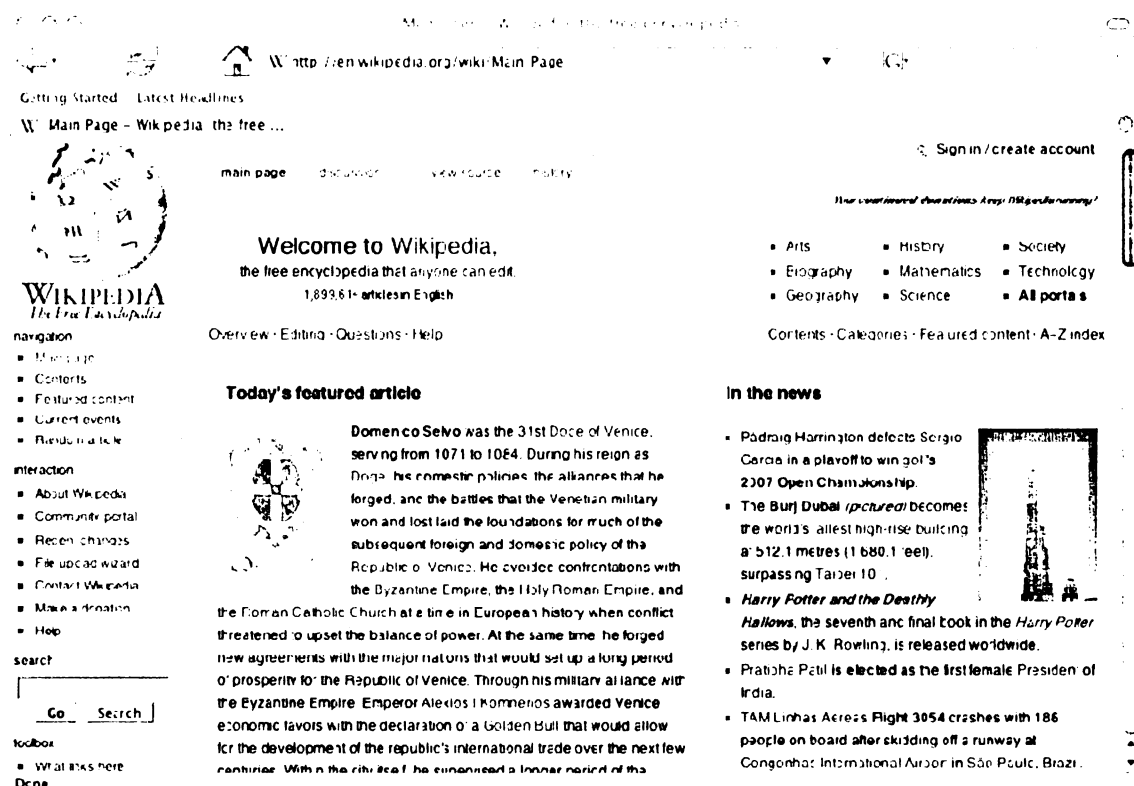
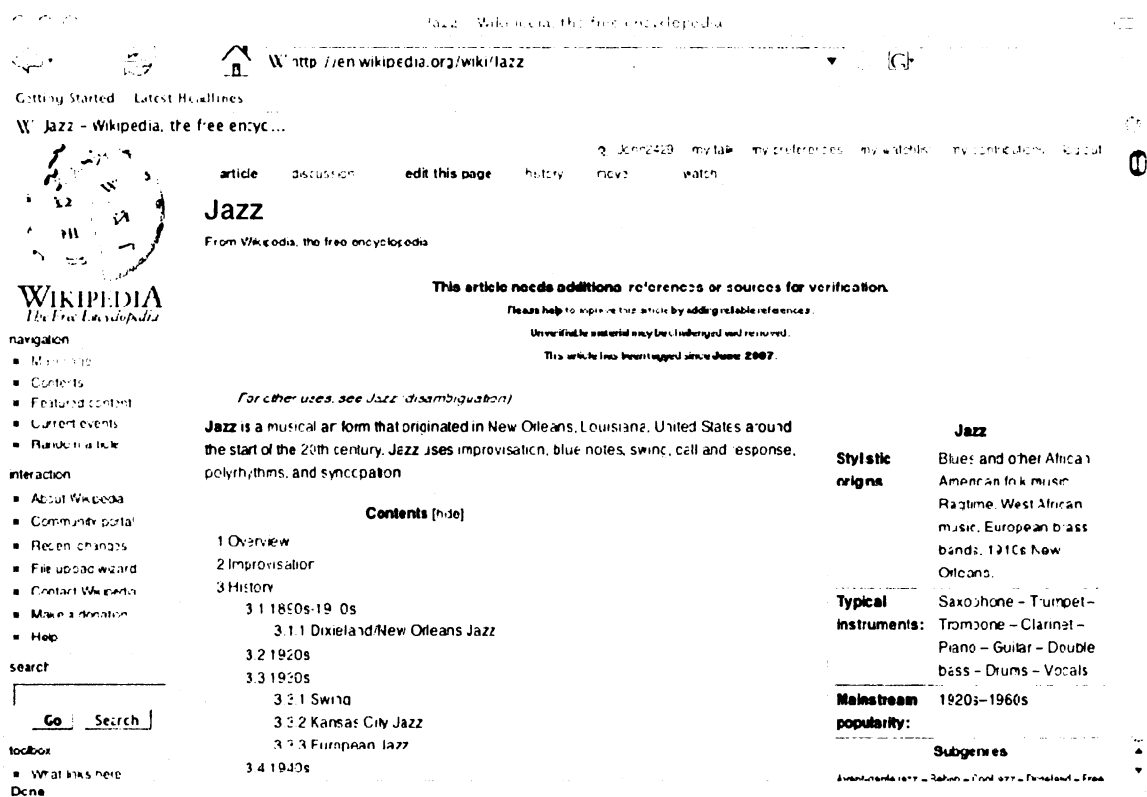


Figure 2. The Main Page for the English Wikipedia, which includes daily “Featured” status articles, and news and trivia sections linked to relevant Wikipedia articles. The Main Page also includes links like “Overview,” “Editing,” “Questions,” and “Help” in addition to the standard strip of navigation on the left of the page. Further down the page, links are provided to help, policy, and community resources.

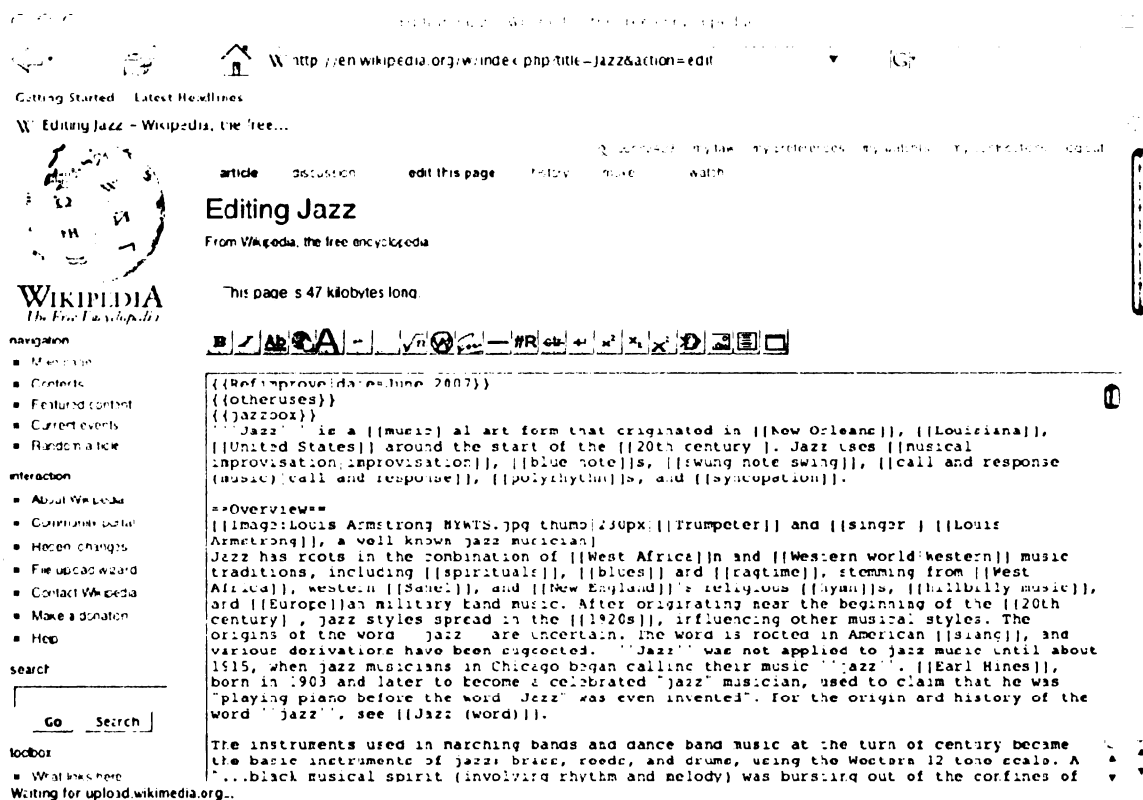


Wikipedia is an online encyclopedia, where articles are connected to each other through hyperlinked text, so that users can easily browse related articles and look up unfamiliar terms and concepts on their respective pages. Each article in Wikipedia is its own page, a “wiki.” A wiki is an instantly editable web page; with a few exceptions, anyone (either as a registered user or an anonymous IP address) can edit any page to change the content of that article. Figure 3 is an example of a Wikipedia article, “Jazz,” and Figure 4 displays the editing window a user encounters upon clicking “edit this



**Figure 3.** An example of a Wikipedia article. “Jazz,” from the English Wikipedia. The navigation on the left remains constant from the Main Page, and “discussion,” “edit this page,” “history,” and other layers of this article appear in tabs near the top of the page. Having signed in, additional tools like “my talk” and “my watchlist” appear at the very top. This particular article makes use of “infoboxes” to the far right, which are standardized templates for subjects in a particular area. Additionally, this article has been tagged as one found lacking in verifiable references.

page.” Users are also able to create new articles and rename, merge, or split existing articles. Each article has an accompanying wiki page known as a “talk page,” where users can discuss changes, propose new changes, or discuss contentious issues in the article’s content. Figure 5 presents discussion from the talk page for the “Jazz” article.



**Figure 4.** Clicking on “edit this page” reveals the simple markup language that constitutes the article. The editor is now free to alter the text and formatting. In addition to the formatting tools above the code, tools below allow for providing a summary of changes made, previewing changes, or inserting characters.

In addition to the article, the talk page, and the editing view, each article (actually, every wiki page – even a talk page) has a “history” display. This displays every change ever made to the page, listing who made each change and when, and allowing the user to compare versions. The article history makes it possible to see an article’s evolution over time, monitor for vandalism, or effortlessly revert a wiki page to a previous version.

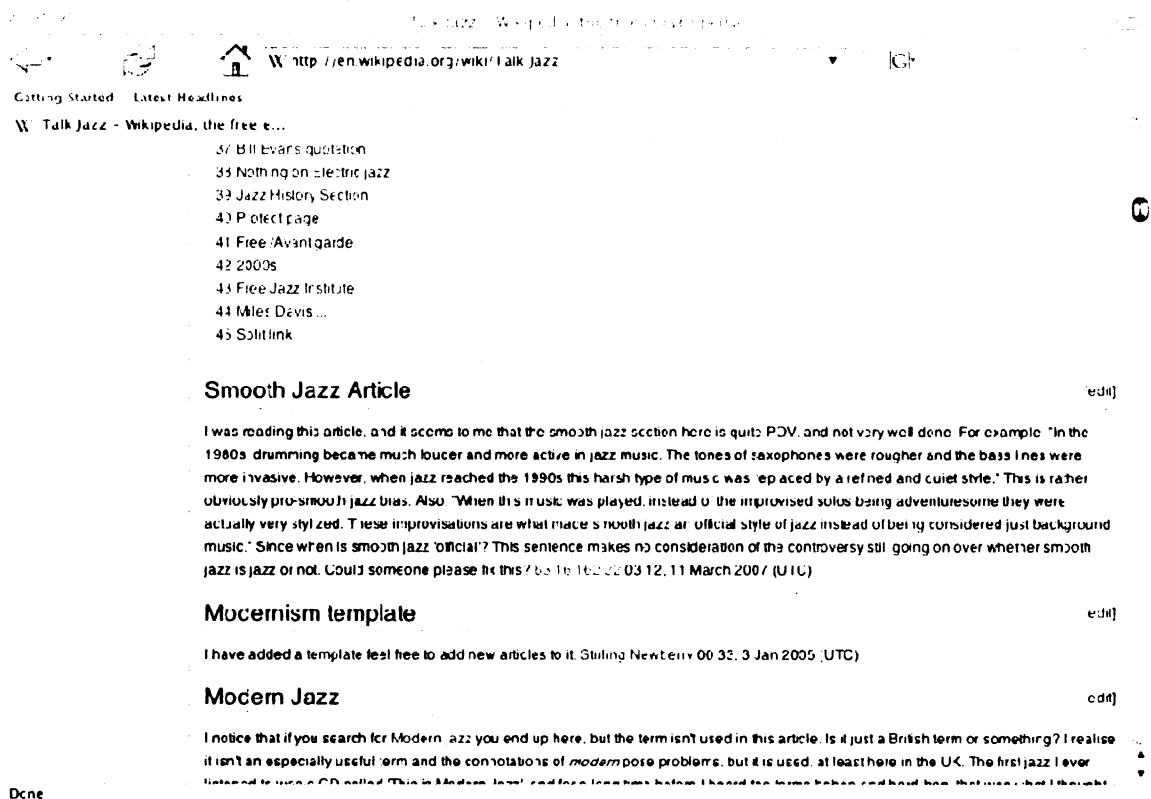
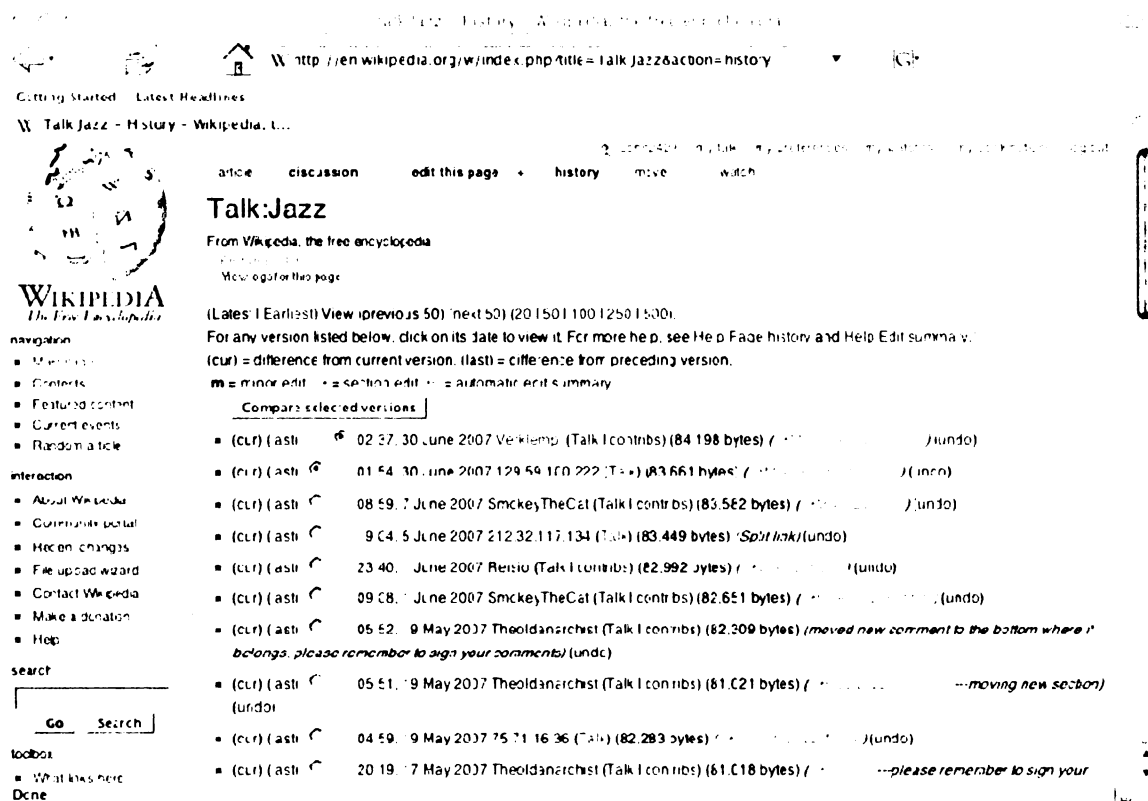


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Figure 6 shows the history for the “Jazz” talk page. These editing, discussion, and monitoring features of the wiki platform are the basic tools for creating the encyclopedia, but Wikipedia has developed additional tools and organization to facilitate collaboration.

There is no centralized command and control within Wikipedia; every user is free to edit the articles they want in the amount or way they see fit – or not to edit at all. The site prides itself on being a freely available resource and open to contributions and sharing of its content. There is some structure to Wikipedia, however. A group of



**Figure 6.** Clicking on “history” reveals every edit, who made it, and when. There are separate history pages for both the article page and the talk page, seen here. The section of the article in which the change was made is noted, along with the optional edit summaries left by editors. Users have the ability here to compare various versions of a page, along the option of reverting the current page to an older version.

editors are selected by their peers to act as administrators. Wikipedia’s administrators are given privileges and tools like the ability to enforce policies by banning vandals and disruptive users, and the ability to protect or delete pages. There is a body of rules and guidelines for behavior and editing practices on the site. Some policies are essential to the project, maintaining constraints necessary for an encyclopedia like a “Neutral point of view” or “No original research”. Other policies are more flexible and subject to adjustment by users. Every policy page is a wiki article (located in a “Wikipedia namespace” separate from the encyclopedia articles), which, of course, has its own wiki

talk page, too. The collaborative approach on Wikipedia is based on consensus, meaning that changes to both article content and site policies and procedures are decided upon by the outcome of discussion taking place on talk pages. The project also has administrative-type positions and policies dedicated to mediating conflict which inevitably occurs between editors working on articles. Beyond this, further governance belongs to Jimmy Wales, who plays an informal but influential role as founder, and to the Wikimedia Foundation, the small non-profit entity created to oversee Wikipedia and its sister projects like Wikitionary and Wikiquote.

Wikipedia has also developed tools beyond the basic wiki features, in order to manage problems like vandalism or editing problems, such as an automated list of recent changes to the encyclopedia, personal “watchlists” noticeboards, article templates, and automated bots that perform custodial tasks. Finally, registered users are given their own space on Wikipedia to present themselves and provide an additional place for discussion. “User pages” and their talk pages are used by editors to create a sense of identity and reputation and allow other editors to contact them.

The Wikipedia phenomenon is made possible first of all by its use of the wiki (“wiki-wiki” is Hawaiian for “quick”) software platform that allows for instant editing of web pages. The wiki was developed by Ward Cunningham in 1995, and has found applications in a range of other encyclopedic or knowledge base projects, and in private projects using wikis for collaborative work by businesses and other organizations (Cortese, 2004; Sunstein, 2007). Wikipedia remains the most successful and prominent use of the wiki. The second Wikipedia enabler is the use of the GNU Free Documentation License (GFDL), adopted from the free/open-source software movement.

Wikipedia is open source, in the sense that it uses a “copyleft” scheme to keep all content generated by contributors freely accessible and immune to capture by anyone who would seek to restrict in any way the use of materials copied or derived from Wikipedia.

Additionally, the specific wiki platform used, MediaWiki (<http://www.mediawiki.org>), is free/open source software. The commitment to openness in Wikipedia is inherited directly from the free/open source movement, which in turn had its origins in the openness and sharing in early software development and in science, which were important precedents for innovation in those fields (Lerner & Tirole, 2005, pp. 48-50).

Wikipedia is seen as an important part of a larger trend in online platforms and the production of content, often referred to as “Web 2.0.” Coined by Tim O’Reilly, the Web 2.0 label has received much attention, including backlash due to perceived overuse of the term and excessive optimism about the model’s potential. Yet, the success of sites like Wikipedia, YouTube, Flickr, del.icio.us, Digg, MySpace, and Facebook implies that the paradigm has much potential, like the free/open source software movement before it. This success has begun to alter notions about the utility of the Internet, the importance of amateurs, and the nature of culture and its production. Wikipedia is an important bellwether for the success of Web 2.0 and user-generated content, as it is a project of considerable seriousness and significance, enjoys very high traffic and search rankings, and has already taken a prominent position in public discourse due to debates over its reliability, utility, and vandalism scandals. Also, contributors to Wikipedia (or at least frequent contributors) tend to be highly committed, referring to themselves as “Wikipedians.”

The encyclopedia is a product of volunteers coming together to create content on a large scale, and economic and sociological theory tells us that the provision of a public good like this is especially challenging, requiring particular conditions. The approach towards motivations here will be economic, rather than social psychological; how is it possible that collective action occurs when rational individuals have no monetary incentives to volunteer their time, knowledge, and expertise? Of special interest is the long term viability of Wikipedia, design implications for this encyclopedia as well as future projects, and the more general implications for the viability of user-generated content online.

### *Collective Action*

The creation of Wikipedia is an instance of collective action, which is the provision of a public good, a specific form of commons (Hardin, 1982; Olson, 1965). Wikipedia is “the free encyclopedia that anyone can edit” (Wikipedia, 2007a), meaning that with a few exceptions like the front page and articles prone to vandalism, anyone can contribute articles, article sections, revisions, citations, or simply grammar and punctuation corrections to the encyclopedia. Coupled with the fact that it is a free resource to anyone (in two senses: both free of charge, and freely distributed content through GNU licensing), Wikipedia is structured as a commons. The term “commons” has been increasingly used in the past decade to describe (or prescribe) freely accessible information, typically online, in arrangements that use open access approaches to facilitate sharing and altering of information in order to promote information creation and dissemination (Bollier, 2007). More generally and traditionally, the commons concept is used to describe shared resources that are susceptible to “social dilemmas” caused by the

“free-riding” that results from shared use without market or state oversight (Kollock & Smith, 1996; Ostrom, 1990). Perhaps the most well known explanation of free-riding and the dilemmas that result is Garrett Hardin’s “Tragedy of the Commons,” published in *Science* (1968). Hardin drew his example of an open pasture from nineteenth-century pamphleteer William Forster Lloyd. In the illustration, herdsmen sharing a grazing commons each seek to maximize their number of cattle, while ensuring their livestock remain sufficiently fed. Each herdsman gains directly from adding more cattle of his own, even when the pasture becomes overcrowded; each only bears a fraction of the costs of overcrowding, however, so the rational herdsmen each continue to add more and more animals, resulting in disaster.

Like most other theorists who have studied commons, Elinor Ostrom has described two variable properties of a commons: subtractability and exclusion (Hess & Ostrom, 2007, 8-10; Ostrom, 1990, pp. 30-33). Subtractability is synonymous with rivalry; goods may be either rivalrous or non-rivalrous. An apple is a rivalrous good, as one person’s use of the good limits the next person’s. Information, in contrast, is non-rivalrous, as one person’s use of information does not limit the next person’s. The tangible form in which information is fixed may be a rivalrous good, however. Exclusion is the extent to which access to a commons is open or closed. Wikipedia is open, with the exceptions mentioned of protected pages, which are relatively closed resources. Exclusion may be achieved either through membership requirements, or imposed costs. Commons that are both non-rivalrous and non-exclusive are referred to as “public goods.” Often, public goods will not be purely non-rivalrous and non-exclusive. Roads and national defense are classic examples of public goods, but roads are certainly prone



to congestion (and toll or weight limit restrictions), therefore they are not purely non-rivalrous or non-exclusive, however. The characteristics which lead to a resource's public good status are typically inherent properties of the resource, making a public good a naturally occurring phenomenon.

*Free-riding and social dilemmas.*

The central problem of all commons, regardless of rivalry or exclusion, is the free-rider problem, in which individuals take advantage of a resource's availability and overconsume, fail to contribute, undercontribute, fail to observe the rules of resource use, hinder the use of others, or otherwise damage the utility of the commons resource. This free-riding leads to "social dilemmas," instances in which the individual incentive to free ride leads to a damaged commons or a public good never being produced. The predicament of free-riding has been formalized into several models: the prisoner's dilemma, the tragedy of the commons, and collective action (Ostrom, 1990, p. 2).

The prisoner's dilemma is a more general and mathematical model that describes the free-rider challenge to a commons. The basic formulation of the prisoner's dilemma consists of two prisoners complicit in a crime who are being held imprisoned separately, with no communication possible between the two. Each has the option of implicating the other. If they both refuse, prisoners A and B will both gain, but refusal by A, for example, bears the risk of playing "sucker" to B should he implicate A. For both players, the overall risk in implicating the other is always less, so prisoners will choose to implicate their accomplice, even though it produces suboptimal outcomes for both prisoners (Axelrod, 1984; Olson, 1965; Ostrom, 1990).

The tragedy of the commons paradigm introduced above was an early model and remains an influential one for the analysis of commons. In Hardin's words,

Each man is locked into a system that compels him to increase his herd without limit – in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all. (1968, n.p.).

His conclusion was clearly pessimistic (Hardin's own purpose was stemming overpopulation), stating that the commons must either be privatized or subject to state control.

In contrast to the tragedy of the commons, which deals with consumption in a rivalrous commons, collective action describes the process of, and challenges to, the provision of public goods (where non-rivalry makes consumption irrelevant). Olson's seminal work *The Logic of Collective Action* (1965) largely addressed the question of how group size impacts free-riding and the ability of a group to meet its collective goals. Essentially, individuals in large groups bear a smaller fraction of the costs imposed on the group and receive a smaller fraction of the group's benefits, so they are less adverse to free-riding. Olson described large groups as "latent" and suggested they can only achieve collective action as a by-product of other, non-collective activities. In contrast, a smaller group may be either privileged, "a group such that each of its members, or at least some one of them, has an incentive to see that the collective good is provided, even if he has to bear the full burden of providing it himself" (pp. 49-50), or intermediate, "a group in which no single member gets a share of the benefit sufficient to give him an incentive to provide the himself," making coordination, organization, and monitoring necessary (p. 50).

Ostrom (1990) emphasized that there are institutional solutions to the free-rider problem. Since Hardin's article in 1968, many have assumed that the tragedy of the commons is inevitable unless coercion is applied by the state, or resources are privatized. The empirical record does not bear this out, however, and Ostrom used detailed case studies of fishing, forests, groundwater basins, and pasture to demonstrate the means by which commons may be effectively governed collectively. A key point of her work is that the solutions necessary for any commons' survival are often specific to that resource, though there are seven common characteristics: clear boundaries exist, rules are tailored to fit the resource, individuals affected by policies can participate in rule-making, monitoring occurs, sanctions are graduated, there are conflict resolution mechanisms, and external forces recognize the right to organize (p. 90). While survival of a commons is possible, the tools necessary are arrived at through trial and error approaches, and no one-size-fits-all solution exists.

Ostrom described three major challenges, or puzzles, that groups trying to maintain a commons face: the problems of supply, credible commitment, and mutual monitoring (p. 42). The problem of supply refers to the provision of rules and mechanisms to manage cooperation, and this is of special interest to Wikipedia, as the site's policies are created and refined to a large extent by the editors themselves. Ostrom pointed out that the provision of a set of rules is a public good in itself, so that the group faces a second-order social dilemma. The problem of credible commitment is a challenge that is potentially irrelevant in online distributed efforts, provided there is a large and active enough user base that defectors can easily be replaced. Lastly, mutual monitoring is another puzzle that seems well addressed by Wikipedia, because of the transparency of

actions on the site. However, costs may be incurred by those who punish others for violating the rules, in the form of interpersonal conflict and escalation, suggesting that monitoring and policing one's peers may not always be an attractive proposition to users.

### *Computer-Mediated Communication as Public Goods*

While the promise of a networked society is often described as the ability of everyone to participate in the global village, especially in the age of Web 2.0, an often surprisingly small segment of the population actually contributes to the flow of information online. Recent estimates suggest that 4.56% of Wikipedia visits involve editing, which is quite high compared to 0.2% for Flickr and 0.16% for YouTube (Auchard, 2007; Tancer, 2007). For the most recent date statistics were available, October 2006, the English Wikipedia had 43,001 Wikipedians who made more than five edits that month, and only 4,330 made more than 100 edits. Only 151,934 of the over 4.5 million registered English language Wikipedians at the time had ever made more than 10 edits (Wikimedia, 2007). Therefore, a “production function,” the relationship between the proportion contributing and the proportion produced (Kollock, 1999, p. 226), is a useful way to examine collective action online because it explains who is doing what work, which can shed light on organizational and incentive structures. The production function tends to follow a power-law distribution of behavior. Research on free/open source software found that 10% of contributors wrote over 70% of the code and 20% contributed over 80% (Ghosh & Prakash, in Lerner & Tirole, 2005, p. 54). Much code gets written by a small few, even in distributed efforts – the Linux kernel, for example, has a Gini coefficient (a measure of inequality where 0 represents perfect equality and 1 is maximum inequality) of 0.79 (Ghosh, 2005, p. 35), and a 2000 study by Ghosh and

Prakash found that “more than three-quarters of the nearly 13,000 contributors made only one contribution; only one in twenty-five had more than five contributions.” (in Lerner & Tirole, 2005, p. 54).

This often “elitist” nature of free/open source software production (Lerner & Tirole, 2002) and other open-access projects may be mitigated by a key attribute, however. The “modularity” of free/open source software, division into multiple discrete components, seems to encourage the distribution of work, and it is often suggested that the majority who make small changes (or identify bugs) are indispensable to the production of quality F/OSS software (Ghosh, 2005, pp. 35-36). Valloppillil (1998) found that five times as many contributors reported bugs, rather than write code (in Lerner & Tirole, 2005, p. 54). Modularity appears to be a necessary requirement for successful F/OSS projects (Lerner & Tirole, 2005, p. 62-64), and modularity is a clear strength of the encyclopedia format that Wikipedia fits into (Benkler, 2001; Coffin, 2006).

Thinking in terms of a production function is also useful for describing small groups who provide a good for their own unique purposes. These are the privileged and intermediate groups described by Olson (1965) and in further depth by Russell Hardin (1982), and these group types begin to explain why personal motivations can lead to collective action. Instances of privileged groups producing public goods were rare until the low-cost sharing opportunities created by the Internet appeared. Small groups, or even individuals, may now produce content for their own purposes, and make it available for others who would use the material. There is no inherent risk, and the potential use by others may even act as an additional incentive. This view of contribution as a “side effect

of private behavior” in the presence of very low costs (Kollock, 1999, p. 229) ties in directly with the reconceptualization of collective action as private/public boundary crossing discussed below (Bimber, Flanagan, & Stohl, 2005).

In the online environment, the changes in costs and benefits are what alter the nature of the public good and the possibilities for collective action (Kollock, p. 223). The Internet radically reduces costs for contribution and cooperation, and it increases the usefulness and availability of existing information. Reducing costs of cooperation matter, as it provides opportunities to “meet, plan, and discuss” (Kollock, p. 224) without the constraints of space or time. Additionally, software design and other technological aspects can function as enablers, too.

In contrast to free/open source software development, Kollock and Smith (1996) described the major social dilemmas in Usenet, an early and prominent online community, along with the potential for overcoming challenges to contribution. Like Wikipedia, Usenet is very large, lacks central authority, and is non-commercial. Potential dilemmas stemming from free-riding included low levels of discussion, unwillingness to answer questions put forth by others, off-topic discussion, misuse of limited bandwidth, and disregard for established norms. Drawing from Ostrom’s recommendations for successful design of commons management (Ostrom, 1990, p. 90), they critiqued Usenet’s ability to facilitate collaboration and found that larger groups online actually led to less free-riding, because the effects of free-riding impact more users and are more noticeable and the reduced costs of communication online made collective action more feasible. While Usenet had boundaries, they were difficult to defend against violations unless membership restrictions or “kill files” were used. They also found that Usenet had

limitations in terms of the kinds of rules that Ostrom stated should be both tailored to the specific community and created by that community (p. 90). Usenet made use of FAQ's, though not consistently, and the policies did not always incorporate community input and were not always effectively communicated to new members. Lastly, they found that the characteristics of computer-mediated communication, especially identity (through email addresses) and the archiving of conversation, made low-cost monitoring and informal sanctioning possible.

Benkler (2001, 2005) has addressed the challenges and potential of moving the free/open source model to applications beyond software, a phenomenon he terms "commons-based peer production," incorporating "commons" because of the free, open nature of these projects. He has advocated viewing peer production as third means of organizing labor, an alternative and complement to the market and the firm, for the creation of information products when human creativity and skill is distributed and variable, and the transaction costs reduced by the Internet would otherwise hinder collaborative effort. "Transaction costs" refer to the economic costs involved in any sort of economic exchange or allocation of resources (e.g. search or contractual costs). Coase (1937) introduced the concept to explain why in the market, firms exist to organize resources instead of a total reliance on the price mechanism for the allocation of all resources. Information technology has the potential to reduce costs and barriers involved with exchange and coordination of resources, and Benkler (2001) characterizes peer production a distinct form of organization resulting from an altered transaction cost structure.

Using Wikipedia as one of his examples, Benkler emphasized the importance of modularity and “granularity” (the extent to which tasks can be broken down into small and variable contributions) for collaboration to occur in a commons (2001). Contributors are self-selected, which is a valuable asset, but it also results in some individuals misjudging their abilities and making poor contributions, which is why peer review and mutual monitoring are necessary. While the technological platform (in Wikipedia’s case, the wiki), allows for smooth and effortless of integration of contributions, social behaviors are needed to remove that which is not worthy of integration, whether vandalism, biased information, or poor writing. Following Lerner and Tirole (2002), Benkler addressed the potential motivations for commons-based peer production, consisting of intrinsic, hedonic motivations (enjoyment of the activities and the creativity involved), and both monetary and social-psychological motivations, which he sees as often inversely related. Wikipedia is a strictly volunteer, non-profit endeavor, so a strong sense of social involvement and/or ideological commitment to the project’s goals may be necessary a motivation, along with intrinsic enjoyment.

That social commitment may at times take the form of a gift economy. Kollock’s (1999) analysis emphasized the gift-giving nature of online communities, drawing from Rheingold’s (2000) early work on the WELL. The existence of gift economies and reciprocity in gift giving was formally described by Marcel Mauss in 1925, and later developed by Claude Levi-Strauss (Godelier, 1999, pp. 10-18). The giving of a gift creates an obligation for later reciprocity, and can also be used to reinforce or signify solidarity and relationships between givers and receivers. Gifts have also been incorporated into the discussion of computer-mediated communication as public goods



by several analyses of free/open-source software projects (Bergquist & Ljungberg 2001; Raymond, 2000; Zeitlyn, 2003). Two definitions are provided by Kollock for gift transactions, taken from Carrier (1991) and Bell (1991). Carrier stated that a gift is distinct from a commodity in that it is provided with an implicit expectation for some sort of recompense at a later, unspecified date. Bell described gifts as involving those transactions that benefit social relationships rather than the production of commodities (Kollock, p. 221-222). Online transactions are surprising, however, when understood as gifts, because individuals are not likely to engage in direct person-to-person reciprocation, especially as groups become large as less defined. Rather, provision of gifts and the subsequent reciprocation occurs in the aggregate. This creates a sense of users feeling entitled to help or information, especially as they continue to provide it to others, a pattern of reciprocation termed “generalized exchange” by Ekeh (1974). This unique form of gift giving is “both more generous and riskier than traditional gift exchange” (Kollock, p. 222). Generalized exchange provides strong incentives for cooperation, yet creates opportunities for free-riding, especially in unstructured communities. Free-riding may not necessarily be the result of self-interest, but may stem from a perceived lack of efficacy or the challenges associated with coordination, where users may not know what to contribute, or how to incorporate their work (p. 223).

#### *Personal motivations.*

Survey studies have identified motivations for contributors to user-generated content’s predecessor, free/open source software, which can broadly be characterized as falling into four categories: social, personal use, career, and ideological motivations (Ghosh, 2005, pp. 32-35; Lakhani & Wolf, 2005, pp. 2-6). Additionally, a division can

be made between intrinsic and extrinsic motivations (Lakhani & Wolf, 2005, pp.4-7). Intrinsic motivations are those directly related to the task, where individuals find the activity worth doing for its own sake. Extrinsic motivations include direct and indirect economic gains, and may include payment to participate, signaling of skills (Lerner and Tirole, 2005a), reputation-building, and skill development (Lakhani & Wolf, 2005, pp. 6-7). Ghosh instead characterized motivation as either selfish or altruistic (2005, pp. 32-33). Selfish motives may be either intrinsic or extrinsic, whereas altruistic motives are either community-based or ideologically driven.

For free/open source software development, social motivations included an obligation to reciprocate, learning, improving, and sharing skills, intellectual stimulation, working with a team, enjoying the sense of community and belonging, earning recognition, and participating in a new form of collaboration. Career motivations included direct monetary gain for contribution, career-related reputation building or signaling of skills, professional need for the software, improving software needed for work, and improving one's professional opportunities. Ideological motivations included obligation to reciprocate, belief in open code, and a desire to beat, compete with, or limit the power of closed systems. Personal use motivations included non-work needs, solving a problem, intellectual stimulation, ego gratification through recognition of one's work, and having the opportunity to see an idea for a software tool or feature come to fruition. Motivations may fall into more than one of these four categories, e.g. reciprocity (Ghosh, 2005, pp. 32-35; Lakhani & Wolf, 2005, p. 15; Lerner & Tirole, 2005, pp. 57-58).

Ghosh found that across motivation categories, the majority of respondents (55.7%) reported taking more than they give, while only 14.6% reported giving as much

as they took and 9% reported giving more (2005, p. 33). Receiving more than one gives is necessary for extrinsic motivations, as they are rational, selfish motives which require a net gain. The net gain consists of both immediate and delayed payoffs (Lerner & Tirole, 2005, pp. 56-57). Kollock also addressed the motivations question for cooperative online activity in general, and found three possible general motivations driven by self interest, and two driven by social considerations. The three general self-interest motivations are anticipated reciprocity, reputation, and efficacy, and the two social motivations are altruism and group commitment.

#### *Organization.*

Lessig (2000) characterized four distinct means of constricting behavior: code, law, norms, and the market. Both code and norms regulate actions in Wikipedia, in that the wiki platform, community guidelines and rules, and social norms all enable certain behaviors while constraining others. Norms become especially prominent as repeated interactions occur and individuals and the community learn individual decisions are poor and which lead to optimal outcomes. Inquiry into the Prisoner's Dilemma game has demonstrated that, given certain conditions, repeated interaction mitigates the impulse to free ride as participants become more aware of the nature of the game and optimal outcomes (Axelrod, 1984, p. 10-11).

Kollock (1999) described a few potential limitations of online coordination. First of all, projects must be "inherently interesting" in order to attract and maintain a group of users willing to volunteer their time. This also raises the question of how applicable the user-generated content paradigm is to other possible endeavors that are not as interesting to potential contributors as Wikipedia or Linux are, for example. Second, large and

complex projects like these require a sufficient base of contributors, a critical mass.

Lastly, structural features of the project must emphasize the important features and tools that enable contribution. A usable design and the ability to make responsive changes are necessary for success.

In free/open source software development, effective communication is crucial to coordination of the process, which explains why the movement really only gained momentum with the advent of the Internet (Lerner & Tirole, 2005, p. 52). Ghosh found that 65.3% of surveyed free/open source contributors were regularly in contact with 1-10 other contributors (2005, p. 37). In contrast, Wikipedia and other wiki projects have communication systems built in. Additionally, the amount of centralization in the organization of F/OSS projects varies, ranging from those with a clear central leader (Linux) to those that are more democratic (Apache). Common features, however, are that the leader has little “formal” authority, but much “real” authority, as their recommendations are very likely to be followed, that there is a certification process for product, that the community trusts the leader’s motives, that the leader is able to create consensus and avoid forking, and that the leader communicates the project’s visions, goals, and procedures effectively (Lerner & Tirole, 2005, pp. 64-65).

*Private/public boundary crossing.*

Following Lupia and Sin (2003), Bimber et al. (2005) challenged the existing traditional conception of collective action based on the observations that Olson’s proposal regarding group size does not carry out online, the choice to participate or not is no longer “binary,” and that formal organization is decreasingly important to successful action. Binary means participation as a yes or no proposition; instead, in the interactive

online environment, the choices about whether to participate or how to participate are often broken up into smaller segments. And, as observation of online communities and projects suggests, size and formal organization are less necessary for successful collective action online.

Bimber et al.'s reconceptualization of collective action drew from Fulk, Flanagin, Kalman, Monge, and Ryan's (1996) description of "communalities," public goods created by the sharing of information resources by a group. While communalities are straightforward public goods, and typically involve a binary decision to participate, Bimber et al. went on to describe "second-order communalities," behavior in which sharing of information is incidental and broken up into smaller opportunities to participate, yet contributes to a greater aggregate which is the public good. Basic functions like searching for information or networking with others are not done for the purpose of sharing information, but end up contributing to the aggregation that forms a second-order communality. Essentially, "private discourse and resources" (Bimber et al., 2005, p. 374) are shifted to the public sphere with no or little cost. Today's Web 2.0 platforms can capture private behavior and allow users to make it public, so that bookmarking becomes a shared activity (del.icio.us, Digg), diaries and opinions become blogs, and photos and movies shared with friends and families are now shared with anyone (Flickr, YouTube) with minimal effort required from the contributor. Bimber et al. saw this crossing of the boundary between private and public as the key to reconceptualizing collective action in our contemporary collaborative media. Wikipedia is not as intuitive an example, initially, but interviews with Wikipedians here and in Bryant, Forte, & Bruckman (2005) suggested that the editing of articles is often an

outgrowth of existing interests and activities users are engaged in. Also, within free/open source software, developers are far more likely to use something they would use themselves (Hertel, Niedner, & Herrmann, 2003, pp. 1171, 1174).

*Wikipedia as a public good.*

As an open commons resource that requires the provision of its content by volunteer contributors, Wikipedia is clearly a public good and therefore subject to social dilemmas. It has distinct technological and social characteristics that both shape the nature of and provide possible solutions to those dilemmas. The technological characteristics of Wikipedia which appear to enable the sorts of interaction and behavior present include important wiki tools such talk pages, article histories, user pages, and watchlists. These have figured prominently into existing discussion of Wikipedia (Bryant et al., 2005; Viégas, Wattenberg, & Dave, 2004), and will here as well. Article histories are similar to the transparent “institutional history” preserved by a free/open source project. Other similarities present in Wikipedia include a sense of meritocracy, a “benevolent dictator,” and modularity (Coffin, 2006). Other features of the site that make collaborative contribution possible include WikiProjects, noticeboards like the Village Pump, and Wikipedia “namespace” articles that delineate policies and guidelines. Active Wikipedians have several means to communicate with each other: article talk pages, user talk pages, IRC (Internet Relay Chat) channels, mailing lists, and namespace articles.

Research into editing practices in Wikipedia has examined the process by which contributors become encultured (Bryant, Forte, & Bruckman, 2005) and considered the motivations and incentives behind “authorship” of articles and other contribution behavior (Forte & Bruckman, 2005). In Bryant, et al., the emphasis was on the typical

process by which individuals come to contribute: they began as readers, slowly became peripheral contributors, and then became dedicated and involved collaborators. This reoccurring pattern of initiation resulted from the architecture of the community and its tools, they argued, and it has major implications for why users contribute and continue to do so:

Likewise, the design of communities in an online environment must meaningfully structure participants' contributions in a way that sustains involvement. That means moving beyond the use of straightforward rewards and into the realm of incentive economies that allow productive participants to achieve higher levels of efficacy and responsibility in the community. (Forte & Bruckman, 2005, p. 5).

Therefore, it would be useful in the present and future studies to include contributors who have not continued their involvement, to begin to address questions of sustainability and incentives for continuance.

In some ways, the Wikipedia community resembles that of the scientific community, relying on peer review and a sense of contributing to humanity's knowledge (Forte & Bruckman, 2005, p. 2-4), though not through primary research, but rather the collection and organization of information. While explicit authorship credit does not exist (and cannot, given the long history of collaborative contributions and revisions to most articles) as an incentive for Wikipedia articles, there does seem to be a pervasive sense of credit within Wikipedia, "as reward for a contribution to the community" (p. 4). A sense of reciprocity, a gift economy, may play a large role in editing activity.

It would be a mischaracterization to label readers of the site or marginal contributors as free-riders. The purpose, after all, is to provide a freely available resource, and contributors should benefit from increased usage of their contributions, as it provides a motivation (writers and editors work in anticipation of others finding their

work useful) and increases the notoriety of the site, drawing in even more readers and contributors, building a network effect. The term “network effect,” or network externality, describes the condition where a good becomes more valuable as more individuals consume that particular good (Economides, 1996, pp. 678-679; Reed, 2001). As more people continue to use Wikipedia as a resource and contribute to it, its value increases and incentives to use and contribute to it in the future strengthen. Those who do not contribute to Wikipedia but use it are not free-riders, because of the nature of the medium – it is a networked digital good, which means it is decidedly non-rivalrous. In this sense, Wikipedia may be one of Olson’s privileged groups, where an individual or small group provides a good they would have anyway, and allows others to freely utilize the open and indivisible resource. The provision of a public good involves a social dilemma of production. So, while Wikipedia readers are not free-riders per se, in the end someone must contribute and have an incentive for doing so.

In contrast to Wikipedia, experiments in other types of open source writing have largely failed because fiction or news is typically only read once (Shirky, 2005, p. 484). The repetitive use and utility of software makes continuous review and alteration possible. The same holds true for a specific kind of writing – reference works. This suggests that the encyclopedia format is critical to Wikipedia’s success. Yet, after six years, persistent questions remain about the quality of the free encyclopedia. For such a high-profile collaboration to remain subject to the sort of critiques over quality and usefulness it does leads one to question the viability of “collective intelligence” and user-generated content. A wide range of work has yet to be done on Wikipedia – not just adding new topics, but improving the existing content.



In discussing Wikipedia as an open-access commons, it is also worth noting that the site has slightly moved away from its original degree of openness, as vandalism scandals in 2005 led to increased limits on starting new articles and editing by anonymous or new members. Vandalism remains a serious threat to Wikipedia, periodically igniting a row over content that may have only been visible for a short time. Vandalism repair may represent a serious drain on the resources of the editing community, though there are users whose primary role is to clean up vandalism or revert to pre-vandalized versions.

Finally, Wikipedia is also beginning to experience forking (when an open source project splits into rival versions) and competition: Citizendium, Digital Universe, and others are emerging as challengers to the Wikipedia model, focusing more on scholar expertise and pages that are less volatile. Forking is discussed by Raymond (2000) as a major deterrent to contribution to free/open-source software projects, so much so that actual instances of forking are quite rare, due to strong community norms against it. However, the nature of the open source licensing makes forking a distinct possibility.

### *Research Questions*

The following research questions will be addressed by the study:

RQ1. What technological and social features enable Wikipedia's survival as a public good and provide individual incentives for contribution?

RQ2. How are Wikipedia's various limitations and challenges related to public good features and social dilemmas?

RQ3. What do the public good features specific to Wikipedia imply about its long-term viability?

## Method

A convenience sample of 27 Wikipedia editors was recruited through two official Wikipedia mailing lists, posts on the Village Pump (an area on Wikipedia for posting assorted community news), posts on three WikiProject pages (WikiProjects are groups devoted to improving articles on a given topic, e.g. jazz), and through snowball sampling. Several respondents saw the recruitment ad when it was recirculated on other Wikipedia-related sites and lists. The editors were interviewed in March and April of 2007, with 15 of them electing to conduct the interview by email and another 12 consenting to hour-long phone interviews.

Editors ranged in age from 20 to 64, with a median of 34, and only included a single female. While it has been documented that free/open source software is dominated by males, around 98% (Ghosh, 2005, pp. 29-30; Lakhani & Wolf, 2005, p. 8), what little data exists on Wikipedia suggests a much higher female presence – possibly 40% (Tancer, 2007). The same data set also found that 82% of editors were over 35 years old, suggesting that a perception of Wikipedians as only teens and twentysomethings is likely a myth.

Of all respondents, the newest editor had been contributing to Wikipedia since August 2006, while several others had been editing since 2002 and 2003. The number of individual edits to the site self-reported by interview subjects ranged from around 200 to nearly 40,000. Not all editors knew their edit count, though others kept close track. Edit counts were confirmed with the Interior tool (available at [http://tools.wikimedia.de/~Interior/cgi-bin/Tool1/wannabe\\_kate](http://tools.wikimedia.de/~Interior/cgi-bin/Tool1/wannabe_kate)), and upon follow-up in June 2007, most editors had increased their count by anywhere from a few hundred to a

several thousand. The median edit count for the 27 subjects in June was 8,677. Edit counts include even minor edits to articles, as well as contributions to talk and policy pages. See Figure 7 for the distribution of individual edit counts.

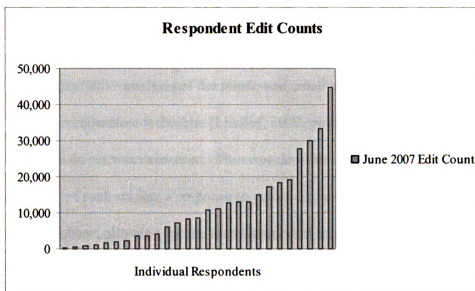


Figure 7. English Wikipedia edit counts for the 27 interview respondents, as of June 2007.

As a whole, the subjects recruited for interviews were subject to several biases, most notably a self-selection bias. Additionally, users were U.S. residents who edited the English Wikipedia (just one of over 250 Wikipedias) and frequented the venues where recruitment notices were placed. These locations were used for their visibility within Wikipedia, in order to reach a large number of users. While snowball sampling and posting on three WikiProject pages led to the recruitment of some casual editors, the respondents tended to be committed Wikipedians. Another possible bias was that of age; presumably many editors (and even administrators) on the site are under 18 years old. The sample consisted of 11 administrators for the English Wikipedia and one former administrator, 3 of who were members of the Arbitration Committee, 2 banned users, and

one previously banned user. Interviewing administrators was likely to result in positive attitudes towards Wikipedia, in contrast to banned users, who would be more likely to criticize perceived weaknesses. Additionally, administrators were not necessarily representative of the “average” Wikipedia editor, because they engage in additional duties and are likely to be more active and invested in the project.

Qualitative analysis of the phone and email interviews was conducted, using the constant-comparative technique (Lindlof, 2002, pp. 218-221), categorizing responses until the data set was exhausted. This was done by transcribing interviews and entering a summary of each subject’s response to each question (and/or a short summarizing quote) into a database, allowing for the identification of trends and variation by comparing all of the responses for each question. For some questions, respondents were in general agreement, while stances on other issues reflected divergent opinions or involved a range of individual variation in motives. This approach also allowed for collection and comparison of basic demographic data, such as age, total number of Wikipedia edits, and how long the respondent had been editing Wikipedia. Because a small, self-selected convenience sample was used, the results are not representative of editors on the English Wikipedia, much less editors in other languages (Pfeil, Zaphiris, & Ang, 2006) or contributors to other online collaborative projects. This sample of Wikipedians was intended to contain especially active contributors who were knowledgeable about Wikipedia and would be able to describe a wide range of activities taking place on the site. The results should illuminate some of the inner workings of Wikipedia and begin to describe why individuals give their time and creativity freely to the project, but further work in this area is needed using random samples of editors.

## Results

As characterized by Bryant et al. (2005), editors would gradually “become Wikipedian,” initially correcting spelling, grammar, or factual errors in articles they have read or used for reference. This finding was confirmed by the respondents here. While some of the interviewed users did not begin editing articles until a year or more after they started using Wikipedia as a resource, respondents typically reported that they would be begin editing within a few months, or even immediately.

Perhaps the most universal finding was that editing Wikipedia was regularly predicated by interest in a topic of intense personal interest. Interviewees reported beginning editing articles because of an interest in their hometown, nationality, academic discipline, military unit, religion, favorite sport, or an existing hobby like American Civil War or Cold War history, along with a desire to improve the Wikipedia articles relating to that topic or to share their knowledge and expertise. This is in line with Bimber, et al.’s (2005) view of collective action in the contemporary media space as a type of boundary crossing, in which personal information or activity becomes public through the low costs of sharing on the Internet. This can also be characterized by Olson’s description of privileged groups, in that the personal incentives for creating the content already existed. Now there are low-cost means of making those private goods public. Assuming the barriers to edit Wikipedia are sufficiently low, there is little cost involved in sharing existing personal or professional expertise in an area. It should be noted that sharing this knowledge does require proactive steps in actually writing article content or hunting down sources, in contrast to other boundary crossing activities which are more automatic and require no creativity, though.

Sharing this sort of information with Wikipedia is also a way to advocate for one's own interests by improving the amount and quality of coverage on the topic, though this will lead to opposition from others if an editor is pushing for non-neutral coverage, especially of a controversial topic or an ideology. Some of the editors began in order to correct perceived bias in articles or because they felt they had knowledge that was lacking from the articles. One respondent saw the emphasis on editing driven by personal interests as the major advantage of Wikipedia over traditional encyclopedias like the Britannica or Encarta:

I don't want to go to Encyclopedia Britannica and read an article about model trains by a guy who was getting paid to write it. Today's he's writing about model trains, tomorrow's he's going to be writing Model T's, you see what I mean? I'd rather read an article by a guy who's really crazy about model trains.

This approach is facilitated by the modularity of the encyclopedia and by the existence of WikiProjects, groups of users with a shared interest in articles on a particular topic.

WikiProjects are devoted to a single broad topic, and consist of a collection of pages where interested editors can notify others of articles in need of particular changes, discuss issues like "Neutral point of view" as it relates to their topic, develop templates and other ways of creating consistency between articles, and otherwise coordinate their actions to improve articles about the specific topic they care about. In addition to the emphasis on sharing one's existing knowledge, several respondents described the research involved in cleaning up articles and properly sourcing them as a way to learn more about a subject, whether an existing interest or a new topic they had a passing curiosity in:

I contribute mainly because I like to learn about things myself. When I write articles, I have to research the subject, and the result of this is an increased awareness and education on the subject.

While a few editors continued to work solely on areas they have a personal affinity for, and remain in a niche space, others described a gradual process of beginning to take an interest in broader editing issues and the inner works of the project.

Other reasons offered for why individuals began to edit the encyclopedia include the notoriety of the site, a conviction that the project was “on to something,” the ease of editing and instantaneous appearance of changes, and developing one’s writing skills. A few explicitly stated feeling an obligation to reciprocate; they used Wikipedia as a reference, so, in the words of one editor, they were bound to “put some water back in the well.” The online encyclopedia’s notoriety in press coverage and especially in Google rankings made the project more credible and meaningful to users, and therefore they saw it as something worth contributing to.

Notably, several respondents reported finding the initial learning curve for editing a bit challenging, but short. Others also expressed their concern that the editing interface (which relies on a simple markup language), automated processes, and policies (which are often abbreviated) are intimidating to new users. A few respondents were involved in actually welcoming new users, and nearly all felt that being open and welcoming to newcomers was an important issue. Edits from new users, whether registered or anonymous, may be treated like vandalism if they run afoul of an editing guideline. Several interview subjects reported editing as an anonymous IP address for quite some time, not registering until they needed to in order to participate in a policy or article deletion debate.

Another universal response was that editing behavior was managed in an ad hoc fashion. Editing of articles continued to be based on personal “interest,” which could

mean one's perennial favorite topics, areas of passing curiosity, or articles stumbled upon while browsing the site. Several described the hyperlinked nature of an online encyclopedia as an aid in finding articles to edit; every article leads to many others of potential interest. Average editors, not just administrators, took interest in behind the scenes work. Nearly all users would engage in behaviors like reverting vandalism, submitting nonsensical or non-notable articles for deletion, commenting on articles up for deletion, commenting on requests for administrator status, discussing policy on the appropriate talk pages, deleting or sourcing unverified statements, copyediting articles, mediating conflicts, and monitoring pages like "Recent changes" or noticeboards for potential vandalism or editor disputes. Just a few respondents did not involve themselves in this sort of maintenance behavior, preferring to focus on creating content in their areas of interest. Some interview subjects saw the maintenance-type duties as part of their responsibility as a Wikipedian and a way of protecting the project from threats, while others described the activities as genuinely enjoyable in their own right. One respondent described the ad hoc nature of choosing what to work on:

If it is an area I have some practical knowledge of, then if I see an article that lacks references or is poorly written, I'll work on improving it. [...] My work is really mood dependent and I switch between six different projects that I am a member of. Some days I don't feel like doing a lot of research, so I participate in discussions of ongoing issues or helping others deal with abusive editors and related issues.

Striking a balance between these duties and the creation of content was seen as a way of maintaining variety and preventing burnout. Because of the distributed nature of Wikipedia, in which thousands contribute to articles in all sorts of ways, one can always move on and let others work on an article, so the ad hoc management of activity makes sense and doesn't amount to free-riding in practice. And, of course, the general lack of



centralized authority means that duties are never assigned, though editors use tools like noticeboards as ways of making sure that priority issues receive attention. The flexibility afforded to users – they can work on whatever they want, whenever they want – makes it a very different kind of labor, or even volunteerism. Respondents consistently reported that their levels of contribution over time to Wikipedia were largely dependent on their amount of free time away from commitments “in real life,” either professionally or personally. When asked about Citizendium, a rival fork of Wikipedia that places an emphasis on experts and control, respondents were skeptical about the interest of professional experts on topics in volunteering their time to a free, open source encyclopedia with a meaningful level of commitment.

### *Identity on Wikipedia*

Reputation was an important part of editing activity of Wikipedia, in a way that was integrated into the underlying structure of the project. While there is no true sense of authorship for articles, every article’s edit history retains a permanent log of who made what edits to the article. There is enough of a sense of ownership of articles that respondents would keep close track of articles they had started or contributed to via their watchlists (the watchlist is a tool built into the MediaWiki software that allows a user to monitor changes to all pages of interest to them). Only a single interview subject rejected any notion of “ownership” of articles when asked about recognition for his work. Editors interact and get to know each other through the behind-the-scenes discussion on article talk and user talk pages, developing reputation through repeated interaction. Requests for administrator status result in a period of public commentary where editors weigh on the merits of the candidate’s work and activity on the site, so reputation matters for those

who aspire to become administrators. There are strong rules against the use of more than one username (“sockpuppetry”) and the use of a single account by more than one individual.

An editor’s sense of identity and reputation was largely represented by their user page, an editable wiki article for each user that provides identification, credentialing, and surprisingly playful user expression. User pages have their own talk pages, which were described as an important setting for discussion and interaction on Wikipedia. Every respondent reported using a user page, with varying combinations of biography, lists of interests, lists of activities and affiliations on Wikipedia, and editing, reference, or administrative tools presented on the page. Many also made use of “userboxes,” small identifying icons that range from the serious (“This user is able to contribute with an intermediate level of Spanish”) to the humorous or trivial (“This user’s favorite color is green”). These allow for personalization of user pages and allow Wikipedians to learn more about each other, strengthening the sense of individual identities. While reputation did not appear to be an overly competitive enterprise on Wikipedia, there is a well-publicized list of editors with the highest counts. Edit counts were not generally seen as especially meaningful, however, because adding a comma to an article, adding a large section of text to an article, and commenting on a talk page would all count equally as a single edit. Conceivably, more advanced edit counters could be developed in the future.

The nature of Wikipedia administrators appeared to be an issue of some debate within the site itself. Many of the respondents, and the administrators themselves, characterized administrative tools as a “mop and bucket,” while respondents more critical of the project and its management saw some administrators as elitists, even petty

bureaucrats, who were overly invested in the site. As of July 2007, 1,266 Wikipedians served as administrators (Wikipedia, 2007b). Administrative capabilities give these editors more latitude in fighting vandalism and managing editor disputes, through capabilities like putting protection or semi-protection on pages, or banning users. Those functions could certainly be prone to abuse, but respondent consensus (even among the critical) was that most administrators were excellent, with a small few who had large egos or were uncooperative. Administrators are selected by the community, through a nomination, commentary, and consensus process. They usually have high edit counts, which a few respondents cited as a reason, along with the selection process, why most administrators were effective, collaborative types. The administrator status is one of the few means by which longstanding, invested members of the community are rewarded or privileged in Wikipedia.

Not all respondents had interest in serving as administrators, either due to the workload, lack of interest in doing even more “custodial” type work, or because they saw it as a thankless task. One editor did state that becoming an administrator was a goal of his. Regardless of whether they become administrators or not, nearly all editors engaged in meta functions, like repairing vandalism and engaging in policy discussions, and expanded their involvement to include articles and issues unrelated to their initial areas of interest, as they “became Wikipedian.” A few editors reported occasionally using the “Random article” link just to find something new to read and edit. Several of the administrators interviewed noted that they did not edit articles and contribute content as frequently as they did when they were simply editors, either because administrative

duties crowded out time for writing, or because they found the behind-the-scenes work of fighting vandals, mediating conflict, and shaping policy more compelling.

One way in which editing by Wikipedians was rewarded was when high quality articles received “Featured article” status and appear on the front page of Wikipedia for that language. There are also daily recognition for work through “Featured picture” status and an article’s inclusion in “In the news,” “On this day...” and “Did you know...” While most users only had been heavily involved with a few featured articles at most, they were well aware if an article of “theirs” had been featured (partially because articles must apply for featured status.) Other forms of recognition that provided positive reinforcement were “barnstars,” informal awards that editors can give each other for especially meaningful contributions, and the even more informal and transitory incentive of receiving a “thank you” from an editor on one’s talk page. Many editors reported finding thank you notes as especially encouraging and motivating, even more so than featured work or barnstars. In general, there seemed to be a limited or at least very informal system for recognizing and rewarding long term or productive editors, or making reputation tangible to the community.

#### *Enablers: Community, Technology, and Policy*

Nearly all editors responded positively when asked how they socialize on Wikipedia. There appeared to be general consensus around a piece of conventional wisdom that a community must exist to support writing Wikipedia, but the community shouldn’t come first. There was awareness on the part of respondents that unconstructive socialization was frowned upon by the majority of other Wikipedians. Several noted that userboxes, for example, have been criticized by a small few as being a waste of energy,

and almost MySpace-ish. Socialization tended to take the form of discussion of articles and policies, but there remained room for more light-hearted behavior, as exemplified by the customization and tone of many user pages. Most on-topic discussion as socialization would take place on talk pages for articles, users, and the “Wikipedia namespace,” a section of articles, all beginning with “WP:” that are devoted to explaining policies, providing tools, and other behind-the-scenes activities (including some humorous pages) that need a centralized location separate from the encyclopedia articles. Additionally, many of the very active editors reported using IRC channels for socialization, discussion, and sharing information on vandalism activity. Wikipedians would also exchange email with other editors they worked with frequently, or if they were involved in a project or conflict. Lastly, Wikipedia provides numerous mailing lists, some private for smaller groups, and some public and very general. The mailing lists generally consist of discussion of current issues on Wikipedia, and relevant policies. Views on the nature of the community tended to fall into three categories: about half saw a healthy, cohesive community of Wikipedia as a whole, while others saw an increasingly fragmented community based around niches or even cliques, and several discounted the meaningfulness or questioned the existence of any real sense of community on the site.

The presence of a community built around the writing of an encyclopedia was cited by users as an enabling characteristic of Wikipedia. It would provide support in collaboratively improving content, and was capable of resolving disputes that may arise over articles. A respondent described the community’s function:

The community is very supportive within itself, helping users who need it and giving a sense of accomplishment to you for your work.

The other two enabling aspects described by users were policy, to the extent that it was easy to understand and flexible enough to meet demands, and the technology: the enabling characteristics of the software behind Wikipedia. The project utilizes MediaWiki software, one of several types of open source wiki software. The ease of use was the first thing many of the respondents mentioned when asked what features enabled their ability to contribute. From the “edit this page” link on every article, to the instantaneousness of changes, the wiki software itself was generally considered by respondents to be a marvel and a driving force behind the project’s success. There are some notable limitations on the MediaWiki software – its lack of WYSIWYG editing, for example – but it was generally commended by editors. Talk pages for articles and user pages, edit histories, and watchlists were core features that most users made extensive use of. MediaWiki is flexible to an extent; several respondents praised the addition of in-text references that had been added. Beyond the software, users described an abundance of tools, policies, and initiatives on Wikipedia that enabled them, like “Recent changes,” noticeboards, namespace articles, and more advanced tools like Javascript consoles for monitoring vandalism. The varied combinations of tools respondents described using suggested a very individualized approach to toolkits, so that Wikipedia’s diverse and decentralized conventions make sense.

Interviewed Wikipedians felt that disputes over articles and practices were inevitable to an extent, because of the character of the project: trying to create encyclopedia articles with a “neutral” perspective by letting anyone make additions, changes, or challenges to the content. Editors observed that conflict was more common and intense when dealing with obviously contentious topics, e.g. abortion or the Israeli-

Palestinian conflict. Respondents were divided, however, over the quality over those types of articles. Some saw them as proof that Wikipedia works, while others felt that controversial topics were one of Wikipedia's weak spots in coverage. The majority of editors had been involved in a couple major conflicts, or "edit wars," at some point, ranging from controversial issues to minutia about word choice or formatting in articles on far more harmonious topics. Many respondents described avoidance as their principle approach towards conflict. Either they felt that their time was best spent moving on elsewhere or expected that others would come in behind them and be more effective in negotiating the article's direction. One respondent described the process from his perspective:

I try, and succeed, to avoid edit wars over content disputes, but I occasionally do get involved with them over issues of censoring or otherwise drastically altering an article without consensus. These tend to be easy to defuse, as there is always a sizeable majority who either don't want the material or if they do, want it discussed first.

A common piece of advice was to "walk away" and cool off if one became embroiled in dispute. Several respondents described this as a negative outcome, however; good, level-headed editors were eventually chased out by point-of-view pushers who are more persistent and aggressive. Policies like a ban on reverting another editor's work more than three times in a 24-hour period were designed to prevent escalation of disagreement, though many solutions to conflict (the various levels of mediation and arbitration put in place) seemed designed to be responsive to conflict rather than preventative.

The transparency of Wikipedia was frequently cited as a fundamental attribute of the site; every edit and discussion comment is preserved in an article's history, which certainly had an effect on the way conflict occurs and is managed. When asked about

conflict, editors often saw it as a necessary part of the process of creating neutral articles, so there may be a sense on Wikipedia that measures to prevent conflict would discourage editing. One official rule that affirms this idea is “Be bold.” A common prediction among respondents was that Wikipedia would move towards using stable versions for volatile articles, with editable versions available behind the stable versions presented for general viewing.

Interviewee responses often reflected a firm grasp of Wikipedia’s policies and guidelines. Policies would either be pointed out in response to a question, either as an example or explanation. Also, responses to a particular question from different editors would consistently reflect established user consensus or conventional wisdom on Wikipedia. Policies are disseminated through devoted pages on the Wikipedia namespace, or by editors that invoke or explain a policy on a talk page (with a link back to the namespace article, of course). Numerous articles exist that summarize Wikipedia policies or introduce newcomers to the project, which is a flexible and redundant, but potentially confusing, approach. The most succinct statement of Wikipedia’s guiding policies is “The Five Pillars” (Wikipedia, 2007c) which summarize Wikipedia policy and include some of the most important principles:

1. Wikipedia is an encyclopedia.
2. Wikipedia has a neutral point of view.
3. Wikipedia is free content.
4. Wikipedia has a code of conduct.
5. Wikipedia does not have firm rules.

Officially, there are 42 policies, including crucial rules like “No original research” and “Verifiability.” Policies have simple titles which are often abbreviated for quick reference, and they are delineated in various levels of detail in the Wikipedia namespace.



While Wikipedia does not have firm rules (one is actually “Ignore all rules”), they do play a very important role in setting norms and providing criteria for conflict resolution, so editors must learn the rules in order to be effective collaborators and in order to avoid sanctions. Several respondents expressed concern that Wikipedia rules may be a barrier to potential or new users, if rules are perceived as too complicated or contradictory.

### *Perceptions of Wikipedia*

When asked why they continue to contribute to Wikipedia, respondents typically pointed to both a personal satisfaction they received from editing and identification with the values and goals of the site. Editors described an ideological commitment to the project’s open model for creating content and sharing it with others. For example, one respondent stated when asked about continuing to contribute:

I like the ideals of the project. Human knowledge should be available to everyone, regardless of ability to pay or location in the world. Similarly, the ability to contribute to that base of knowledge should be open to everyone that wants to do so constructively. As long as Wikipedia allows that, I will happily help with it.

Other recurring themes were Wikipedia’s prominence, the scope of the project, the ability to share information with others, reciprocity because they use Wikipedia, a sense of fulfillment, investment in the pet topics that drove them in the first place, the ability to develop writing and discussion skills through collaborating with others, a sense of belonging, the fact that there is so much work yet to be done on the site, and the idea that the work could never be “owned” because of the GNU licensing. Editors saw Wikipedia as an opportunity not only to sharpen their writing skills, but also to develop collaborative skills. Describing it as a way to learn skills for engaging with other people

online, using techniques like addressing individuals by name, one respondent said about Wikipedia:

You develop skills that are very much needed, because most of our communication today is through email, or through blogs and whatever you are writing. Your ability to address people on the human side as much as the intellect, and respect them as a person, comes through when you write. That is really attractive, because you are learning new skills in an environment in which you can actually do it and practice in a way you cannot do it anywhere else.

Interviewees also saw editing as a powerful learning tool for themselves. If they had the need to work on articles beyond their existing knowledge base, editors would go out of their way to research new topics, finding facts and sources for inclusion into articles.

Several Wikipedians even reported going as far as picking up books from their library for the purpose of adding information and sources not available online.

Editors expressed a sense of self-efficacy by describing their own knowledge, background, or skills that enabled them to be productive contributors. The emphasis on editing articles of interest to them implied that users felt they were making unique or meaningful contributions. However, respondents were rarely defensive of their work, because everything on Wikipedia is potentially subject to review and alteration.

Respondents were not defensive of their “turf,” either. When asked about editors who had similar interests or experience, nearly all respondents saw those types as editors they were most likely to collaborate effectively with. One prolific editor and administrator was discouraged, however, when articles he and others had improved to “Featured” status quality were “fiddled to death by the masses” after being featured and actually ended up in poorer shape. This resembled the previously described effect of aggressive point-of-view pushers chasing out good editors who became frustrated, suggesting collective action, or at least the presence of more “eyeballs,” was not always successful. In addition

to self-efficacy stemming from personal expertise, editors also appeared to feel empowered by the technological and organization tools at their disposal.

Respondents were not in agreement over what the weakest sections of Wikipedia coverage were, but some drew a connection between weaknesses and perceived systematic bias in Wikipedia's user base, asserting that there was excellent coverage of popular culture, current events, and technology topics at the expense of historical, humanities, and global topics. Several editors felt that the site's user base was overly representative of the highly educated, technically adept, and affluent, and that this biased the perspective of the Encyclopedia as a whole. Two editors noted:

The historical content, and the humanities content more broadly, is universally weak (with the exception of the ever popular military history). It will be a long time before comes up to an acceptable level.

Wikipedia is still substantially incomplete outside the main interests of 15-30 year old male computer professionals. Much work remains to be done.

Wikipedians were quick to stress that the encyclopedia is a work in progress, and as long as there were areas with less than ideal treatment, there would be strong incentives for individuals to improve them. Some respondents expressed concern over a dispute between "deletionists," administrators and other editors who would make an effort to remove articles on arguably non-notable topics, and "inclusionists," those who saw no harm in allowing non-encyclopedic content to remain if someone might find it useful. At 1.8 million articles on the English Wikipedia alone, as of July 2007, Wikipedia is broader in scope than any traditional encyclopedia, so determining the boundaries of notable encyclopedia-worthy topics is certainly a discussion worth having.

One area where consensus did exist, however, was that biographies of living persons on Wikipedia were a serious problem. Biographies were described as prone to

unsourced negative statements, although a policy was created to specifically address this weakness and several others following the Seigenthaler controversy in 2005 (Hafner, 2006; Seelye, 2005). When asked about the future of Wikipedia, the biggest concern among respondents was that the encyclopedia and Wikimedia Foundation were vulnerable to defamation lawsuits. Another perennial threat, especially to Wikipedia's reliability, is vandalism. The Wikipedians interviewed were nearly unanimous in their description of vandalism as "juvenile" behavior from children, the easily amused or bored, or visitors who wanted to see if their change would really appear. Editors were not in agreement on the seriousness of the vandalism problem, however. Some stated that it was "not really an issue" and that there seemed to be plenty of "eager vandal fighters." Several respondents enjoyed reverting vandalism or used it as a diversion from other work. Others saw the constant influx of vandalism as a threat to reliability, and noted that persistent vandalism in an article discourages editors. These respondents tended to be in favor of changing Wikipedia to prohibit anonymous editing, which apparently accounted for the majority of vandalism. Those less concerned about vandalism maintained that anonymous editing is important to keeping Wikipedia open and welcoming. In any event, accounts or anonymous IP addresses that commit repeat vandalism would get banned, and multiple tools were described for monitoring vandalism and encouraging Wikipedians to revert it, including the fact that every edit is recorded and reverting pages to previous version is a simple process.

Several administrators interviewed made the claim that Wikipedia is something that shouldn't work in theory, but does in practice. Others noticed that Citizendium and other rival wiki or encyclopedia projects online face competing with a substantial first-

mover advantage for Wikipedia. These suggest that in many ways, Wikipedia's success may be due to a perfect storm of factors coming together: the inherent characteristics of an encyclopedia (a wide-ranging collection of sourced summaries of topics), the simplicity and transparency of the MediaWiki software, the decentralized and open community, policies, and management that have emerged on the site, and a strong network effect.

### Discussion

Research Question #1 asked, "What technological and social features enable the Wikipedia's survival as a public good and provide individual incentives for contribution?" The enabling features described by the users interviewed here might be best categorized as technological, organizational, and social, because much of Wikipedia's organization and policy are not dictated by the technology but have developed in response to user need. Some of the technological features that appear to facilitate the creation of a public good through collective action are the *ease of use*, which reduces transaction costs to the level where individuals are able to add information simply and in an ad hoc fashion, and *transparency*, which keeps vandals and content disputes manageable and allows users to make smart decisions about editing. The enabling organizational features described by Wikipedians were the *policies* created and enforced by the editing community, the *flexibility and redundancy* in the presentation of policies and in activities like fighting vandals, and the *openness* and flat hierarchy. The social features which appear to facilitate collective action are user *identity and reputation*, the *mediation* of disputes over editing by other willing Wikipedians, the *sense of community* and belonging on the site, and *ideological conviction* in Wikipedia's model

and the meaningfulness of its goals. All of these social characteristics have the potential to provide for a strong sense of *reciprocity*, or gift economy.

Research Question #2 asked, “How are Wikipedia’s various limitations and challenges related to public good features and social dilemmas?” Perhaps the most persistent criticism of Wikipedia is the question of its reliability. The dynamic nature of the content means that direct quotations or references to text from any given article are not useful, as the text may change. Jimmy Wales and others have argued that Wikipedia shouldn’t be cited anyway, though many users may mistakenly use Wikipedia as the final (or sufficient) word on a topic. Perhaps a bigger consequence of the dynamism is that one might encounter fleeting vandalism in an article. Happily, as Ciffolilli (2003) pointed out, there are strong disincentives to vandalism: Wikipedians are constantly monitoring for vandalism, and the cost of removing it and restoring damaged content is incredibly low. Vandalism appears to have a negative effect on the utility of the encyclopedia in two ways: a reader may encounter it in passing, before an editor has had a chance to remove it, or a clever vandal will make subtle changes or fake a citation in order to get their change past editors for a more lengthy period of time, as in prominent instances of vandalism in Wikipedia articles on both golfer Fuzzy Zoeller and actor Sinbad. Acts of vandalism by juvenile or ill-intentioned users can be seen as form of free-riding. They are taking advantage of the existence of a prominent public good (Wikipedia is certainly a more appealing target now than it was in 2003) to amuse themselves or mock others. While the transaction costs for vandalizing Wikipedia (because of its openness) are certainly lower than for, say, vandalizing the front page of the New York Times website, the multiple responsive systems for reverting vandalism

and banning vandals makes it unrewarding to vandalize Wikipedia, or very costly to do so effectively. While having low barriers to contribution is a fundamental attribute of Wikipedia, and necessary for bringing in more effective editors, higher barriers would deter vandals and some point-of-view pushers. Finding the right balance is difficult, as reflected in the disagreement by editors over whether allowing non-registered users (anonymous IP addresses) to edit should continue.

Wikipedia, as a collaborative encyclopedia, strives to be neutral in tone, without editorial voice. For our purposes here, we can simply hold this questionable notion of “Neutral point of view” as an assumption and ask if collective action is able to produce articles that adhere to the site’s notion of neutrality. A common form of free-riding as described by respondents was that individuals would push their own points of view in their edits, disregarding the “Neutral point of view” policy (either through unsourced statements or selective sourcing). This can be characterized as free-riding, because individuals are not engaging in the behavior expected, cooperating to meet a group goal, but rather using the public good that is Wikipedia to try to further their own ends. Additionally, when editors are driven out of an area by frustration with point-of-view pushers, they are free-riding as well – relying on others to come in behind them and continue the fight. To the extent that there are enough Wikipedians interested in doing so for the given article, the public good will still be provided. Interview respondents did note that they would often stand their ground and request the assistance of third party mediators, which alleviates the social dilemma. Affinity for Wikipedia appears to lead users to do this kind of mediation work, or edit on topics that are not necessarily of passionate interest to them but may need assistance. And, as with other problematic

areas, policy and organizational structure has been developed to address editing disputes. One of the five pillars of Wikipedia is that there is a code of conduct for editing. Conflicts may be addressed by the various groups of mediators and arbitrators available, and users can be banned for violating policy.

Much like the possibility of neutrality in articles is questioned, Wikipedia is often disparaged as “truth by consensus” or an averaging and dumbing down of information. This remains an argument best examined through other methods, especially content analysis. The issue at stake here is whether consensus through collaborative writing in a wiki can be achieved and an encyclopedia can be written through this form of online collective action. Additionally, Wikipedia is criticized for placing emphasis on particular types of content, especially popular culture, at the expense of other areas. Provided the project continues to flourish, increased recognition of Wikipedia’s significance will strengthen the network effect, which should lead a wider range of users to the site, which in turn would mean wider and fuller coverage. However, this can only happen if transaction costs are kept sufficiently low or reduced even further, meaning that improvements to the MediaWiki software (e.g. WYSIWYG editing) should take place and policies and organization should be conveyed more clearly to newcomers. It is fair to ask at what point in time Wikipedia will have sufficient depth in its coverage. The breadth of the topics covered is not matched by the detail, with many underdeveloped articles throughout the site. Certainly, creating such a large encyclopedia and giving it sufficient balance and depth is not a task that can be done instantly. Six years in, Wikipedians emphasized in interviews that the site is a work in progress. Comparisons are not helpful in determining the amount of collective action versus free-riding taking



place, because nothing like Wikipedia has been attempted before, and the site certainly surpasses any other online volunteer projects in being able to successfully turn out material.

Questions remain about the general quality of writing on Wikipedia, however. Duguid's (2006) analysis suggested that editing takes place at too granular of a level (editors focus on a particular section, sentence, or fact), leading to inconsistent or redundant content in articles. He also made described a strong tendency on Wikipedia to use contemporary information or sources to extrapolate to the past, which is an effect of the reliance on web-based or contemporary sources. Several respondents described going to lengths to use print sources for articles they were working on, which would be positive trend were it to become widespread, though this is a high-cost activity. Duguid's conclusion is that bad edits drive out good edits (a play on Gresham's Law, which one respondent actually used as an analogy, too). In contrast, analysis by Wilkinson and Huberman correlated high edit counts and article quality, but only for featured articles, which does not address the question of whether highly edited, poor quality articles are abundant. Future work in this area is needed, using content analysis and tools like the "history flows" of Viégas et al., to demonstrate whether editing practices are leading to quality encyclopedia articles.

Much like barriers protecting against poor edits and vandalism, a delicate balance must be struck in rewarding reputable users with authority. Too much hierarchy would damage the flat, egalitarian nature of the Wikipedia commons that appears to have been so successful, but privileges and structure are important means of managing activity (Ostrom, 1990, p. 90). Administrators and others who engage in meta functions appear to place an emphasis on those maintenance behaviors often at the expense of article writing,

but the administrative duties are clearly essential to the project's success, and the tasks seem to be an appealing and rewarding activity for a substantial number of individuals. Ostrom characterized the provision of rules as a potential second-order dilemma, and stated that group members require involvement in the rules governing the system. The dilemma seems to be surmounted, to the extent that Wikipedia rules continue to be functional and foster the growth of quality articles. It is significant to find that most respondents, not just administrators, were involved in policy discussion to some extent, and that they found it an interesting and engaging activity that was an alternative or supplement to editing, much like vandal fighting. There also seemed to be an inherent, almost navel-gazing kind of interest in how and why Wikipedia works, and how it can be improved. This is likely the result of the ideological commitment to the project paired with the enjoyment Wikipedians find in activities related to self-governance. Future empirical work is needed to determine how invested and efficacious less active Wikipedians feel in the policy creation process. An additional concern is that as Wikipedians broaden their activity on the site, they may write or mediate on topics that they do not know enough about to avoid making serious factual mistakes.

Research Question #3 asked, "What do the public good features specific to Wikipedia imply about its long-term viability?" An easily overlooked aspect of Wikipedia is the simple fact that Wikipedia is an encyclopedia. The nature of the enterprise has made successful collective action a distinct possibility. The utility of the site makes reciprocity a powerful force, a neutral and verifiable account of each article topic provides a goal and framework for contributing, an encyclopedia has massive scope but is highly modular, and enthusiasts seem to be especially attracted to articles on the

subjects they are interested in. This has resulted in the systematic emphasis on popular culture, current events, and technological topics, however. While wikis are being used for applications from online fandom communities to knowledge management by businesses, Wikipedia remains the shining example of the wiki's potential. For example, there are several other wiki projects under banner of the Wikimedia Foundation that are not nearly as successful as their sister project, Wikipedia. Wikiversity lacks the modularity of an encyclopedia, while Wikinews entails high cost newsgathering activities, and Wikitionary has limited intrinsic appeal as an activity.

In describing traditional collective action, Olson (1965) asserted that larger groups would be less successful because free-riding was more tempting as one's share of the good became a smaller fraction, and because coordination becomes more difficult. In online settings, however, larger groups appear to be more successful. In Wikipedia, if you free ride on one article or opt not to make a particular edit, there are enough users that it is probable that someone else will provide instead. As Bimber et al. (2005) noted, the work of online collective action has been split up into smaller pieces, so that deciding to free ride is no longer a discrete choice, but a series of ongoing opportunities to share. The scale and openness of Wikipedia and the organizing power of the wiki appear sufficiently potent enough to make ad hoc, unorganized contribution an acceptable way to contribute to the provision of this particular public good. However, it is conceivable that largeness may have a negative impact on the importance of identity and reputation, as editors become less likely to have encountered each other before. The sense of community has the potential to become less cohesive and more fragmented as the site grows.

The development of the wiki was groundbreaking; it offers an ease of use and reduced costs for creating and sharing content on the web that is only rivaled by social networks. Wikipedia has successfully lowered the cost of contributing to the point where, for a significant number of people, that cost is outweighed by the benefits received. The question remains, what are those benefits that, for thousands of Wikipedians, are outweighing the cost of contributing? Answers to the general question of personal incentive and motivation are suggested by the interview data: *personal interest in topics* coupled with *low costs of sharing*, the *reciprocity* provided by the site (which is also furthered by the network effect), the *skills developed by contributing*, and the *enjoyment* that is gained through *intellectual stimulation*, the *sense of community*, and the *challenge of coordination*. These are the reasons that the interviewed editors gave for why they choose to contribute to Wikipedia. As with other activities, like free/open source software development, the combination and relative importance of these rewards appear to vary. Ghosh (2005) and Lakhani and Wolf (2005) described similar categories of motivation for contributors to free/open source software: social, personal use, career, and ideological motivations. Career motivations would not characterize Wikipedians, but social motivations are seemingly evident, personal use entails editing on topics of personal interest, reciprocity, and developing skills, while ideological motivations were suggested as well: belief in both the importance of free and open content and the meaningfulness of Wikipedia as a resource. While reputation remains an important component of the collaborative process, Wikipedia is most noticeably distinct from free/open source software development in that it lacks career related concerns, or “signaling,” as a motivation to contribute.

In many ways, Wikipedia fits the description by Bimber et al. of collective action in contemporary online media. Reduced costs make the sharing of information previously existing in a personal space possible, so that it crosses the boundary into public space. Wikipedia editors are largely sharing their personal interests and knowledge with others when they edit. However, Wikipedia does not conform to the “boundary crossing” description as fully as other Web 2.0 entities like MySpace’s social networking, Flickr’s photo sharing, or del.icio.us’ social bookmarking, because editing an encyclopedia is a far more active process, involving the creation of content that typically did not exist before, and Wikipedia entails collaboration not necessary for projects like Flickr and del.icio.us that are built around aggregation rather than cooperation. Additionally, the contributions of Wikipedia editors are likely to have limited utility to them because they are sharing basic knowledge about a topic. While an editor might refer back to a page they worked on, especially if others have made significant contributions as well, the Wikipedia model relies far more on reciprocity, as an encyclopedia has great utility. Not only is an encyclopedia obviously useful by its very nature as a reference work, but its modularity means that that the utility for any individual is unique and varied. Users will find articles that others have created on many different topics they aren’t familiar with or need to refer to the most useful.

In some ways, Wikipedia more closely resembles the traditional model of collective action articulated by Olson, where users must choose to act based on personal incentive, and organizational structure is typically necessary to achieve collective goals. Wikipedia as a whole is an intermediate group, where individuals have strong incentives but organization and rule-making are necessary for coordination. Individual articles may

be the product of a cooperative intermediate group, or of a privileged group or individual that had existing incentives to create the good and simply crossed the private/public boundary through low transaction costs and a sense of reciprocity. Yet Wikipedia as a whole may also be seen as a privileged good, in that a small group of thousands has sufficient incentives to create the resources and share it with the rest of the world. For these reasons, Wikipedia fits both the traditional and reconceptualized notions of collective action. In comparison, Wikipedia's intellectual precedent of free/open source software development also resembles both models of collective action. It is a group of laborers choosing to come together to create a product, but is also hackers sharing improvements and alterations that they are producing for their own personal use.

The present study is limited first and foremost by the use of a non-random sample. Self-selection bias and most respondents' high levels of activity and involvement with the site limit the generalizability of responses. There are also biases expected from interviewing American contributors to the English Wikipedia rather than a broader representation of Wikipedia editors. Finally, the nature of the qualitative interviews conducted and the self-reported behaviors and attitudes involved limit the study as well.

Future empirical work is necessary to fully describe the performance and limitations of collective action on Wikipedia. Further work is needed on the production function, and how less integrated or active editors understand and make use of or even understand identity, norms, and other organizing features on Wikipedia. For example, is there a threshold at which editors are likely to create and make use of a user page? Perhaps the most pressing need for Wikipedia research at this point is to collect random

samples of Wikipedia editors and begin to determine what the demographics and characteristics of Wikipedians are. Wikipedia is heavily used, but only a small fraction of those users give back. For what kind of person does the cost/benefit calculus result in a positive on the benefit side, leading to the decision to edit?

Wikipedia exhibits the requirements needed for successful collective action, providing strong individual motivations to contribute that overcome costs, and offering principled yet flexible organization and policy. This is while remaining radically open and decentralized, exhibiting the characteristics of collective action online, as defined by the sharing of personal activity with the public sphere through technology that radically lowers transaction costs. While questions remain about the site's value as a reference tool and what it implies about information and gatekeeping authority in the 21<sup>st</sup> century, the problems related to the remaining social dilemmas on Wikipedia have the potential to be solved as the project matures. Whether collective action can address these challenges will be an important precedent for collaboration and user-generated content online. The technology, organization, and community involved have made effective collective action a reality for Wikipedia and have the potential to advance that action further.

This study suggests that Wikipedia has achieved the success it has because of both inherent characteristics and constructed systems that have been conducive to collective action. Other online projects and communities seeking to apply the Wikipedia model must assess whether enough of the same or equivalent incentives and structures exist in their own endeavors, and whether a sufficient number of users will find that the benefits of participating outweigh the costs. Additionally, Wikipedia is an important point of reference for collective action online because it requires both the active, dynamic

organization needed for collective action offline, and the reduced barriers and ease of transfer that characterized many user-generated websites. The findings here reinforce the literature's emphasis on overcoming the free-rider problem through both existing incentives and organizational approaches. These solutions to social dilemmas remain important, even a new and changing world of decentralized and open information.



## Appendix: Interview Questions

Name: \_\_\_\_\_ Age: \_\_\_\_\_ Gender: \_\_\_\_\_

Email Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Are you a U.S. Resident? \_\_\_ Wikipedia Username: \_\_\_\_\_

Dates (MM/YYYY) of Wikipedia use, as a reader: \_\_\_\_\_ to \_\_\_\_\_

Dates of Wikipedia use, as a contributor: \_\_\_\_\_ to \_\_\_\_\_

In a few sentences, briefly summarize your history of Wikipedia activity, including types of contributions and average frequency.

1. Why did you choose to begin contributing to Wikipedia?
2. Do you utilize a user page?
3. How many edits have you made to date?
4. Do you have special status on Wikipedia (for example, administrator)?
5. How many new articles have you created and how many articles have you made major contributions to?
6. What kinds of contributions do you make to Wikipedia?
7. How do you choose what sorts of changes, additions, or other contributions you will make?
8. What features of Wikipedia aid your ability to contribute, or encourage you to do so?
9. How do you utilize talk pages, histories, and other tools?
10. How many articles are on your watchlist, or do you otherwise monitor?
11. Have you had a page of yours featured or received other recognition for your work?
12. What administrative or “meta” functions do you perform?

13. How do you socialize or interact with other Wikipedians? How would you describe the sense of community?
14. Have there been points at which your frequency or type of contributions changed significantly? What led to those changes?
15. Why do you continue to contribute to Wikipedia? Do you see yourself continuing indefinitely?
16. What “edit wars” or similar conflicts have been involved in, what was your behavior, and what is your attitude towards conflict over articles?
17. What major shortcomings have you encountered on Wikipedia, in terms of content? What corrections and additions were you able to make? What is your attitude towards underdeveloped articles or sections?
18. What are your attitudes towards those Wikipedians/users who:
- Are very active contributors?
  - Act as administrators for the site?
  - Are similar to yourself in experience or area of interest?
  - You’ve had conflict with over articles?
  - Make marginal contributions?
  - Are newbies?
  - Vandalize?
  - Are only readers rather than contributors?
19. What do you think of restrictions placed on editing for sensitive topics or those prone to vandalism?
20. What is important to you about Wikipedia?

21. What do you think of Digital Universe and Citizendium? Do they present a challenge or threat to Wikipedia?
22. What do you think the future of Wikipedia might be?
23. What other wikis or open sites do you contribute to?
24. What do you think the future of user-generated content/open-source projects might be?
25. Are there any new or occasional contributors whose work you've noticed, that I might be able to recruit for this study?

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