

Quantity and quality: understanding contribution of knowledge to public document repositories

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Abstract

There are many publicly accessible repositories on the Internet that are created by firms and professional bodies. Such repositories are created by the uncompensated efforts of individuals contributing content e.g. book reviews or review of attractions at tourist destinations for the benefit of unknown others who may be considering reading the books or planning visits to these destinations. While the potential value of such publicly accessible online repositories is recognized, there has been little prior work examining the willingness of individuals to make contributions to them and on factors influencing the quality of their contributions. We draw on social psychological theory and theory on prosocial behavior and volunteerism to examine this phenomenon and highlight the factors motivating individuals to make contributions to online repositories. We examine these questions using data on the profiles of contributors of reviews to a publicly accessible review repository. We find that contributors have a varied set of motivations for contributing, that a potential contributor will be more likely to contribute in an area with fewer prior contributions, and that repositories include content both from experts and non-experts. Finally, the quality of an individual's contribution is determined by not just his own expertise but also the quality of contributions of his referent group of contributors.

Keywords: Document repositories, qualitative data analysis, and prosocial behavior.

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1. Introduction

The Internet provides a variety of public repositories of knowledge in different subject areas. Examples of public repositories are the repository of reviews of holiday cruises at www.cruisereviews.com, an open-content encyclopedia at www.wikipedia.org, product reviews at www.dooyoo.co.uk and knowledge on veterinary science at www.vin.com. Sites such as Amazon.com and BarnesAndNoble.com maintain extensive repositories of content comprising reviews of books, music and CDs contributed largely by customers. The review repository at Amazon.com has reviews written by nearly two million volunteer reviewers. The contributions of this large army of uncompensated reviewers are often considered central to the value delivered by online retailers like Amazon.com and BarnesAndNoble.com and content sites such as Cruisereviews.com.

While the potential value of such public online repositories is well recognized, there has been little prior work examining motivations for repository contributions. While the success of document repositories depends largely on the volume and quality of contributions, there has been little effort to understand these aspects of the phenomenon.

Much of the prior work on online forums has been restricted to email networks and bulletin boards (e.g., Butler 2001, Constant et al. 1996, Wasko and Faraj 2000). Compared to such forums, the act of contributing to a repository has both similar and at the same time some distinguishing characteristics. Like email and bulletin boards, there is an impersonal interaction with a database, and there are few, if any, social cues (Sproull and Kiesler, 1986). Users typically log into the system, fill out a form describing the contribution and either attach a document or pastes content into a text box. Moreover, extrinsic rewards for contribution are often nonexistent and at best, minimal. Unlike email and bulletin boards, however, repository contributions are usually made without any appeals or requests for help for information. In addition, contributors usually get very little feedback on whether and also how their contributions are helpful to others. While repositories usually provide mechanisms for users viewing the contributed documents to

provide feedback on the quality of the material, providing such feedback is almost always voluntary and it is often not provided¹. Repository contributions therefore represent uncompensated volunteering by individuals for the benefit of others. The prevalence of such behavior raises two broad research questions: a) what are the factors motivating individuals to make repository contributions? b) What are the factors that influence the quality of contributions? To the best of our knowledge, this paper is the first attempt to address these questions in the context of online repositories. We draw on prior work in a related arena - on pro-social behavior in conventional contexts of helping, and social learning and social comparison theories to examine these questions.

Establishing document repositories populated with content that users find useful is a complex task (Charles, 2001). An approach focused on size and amassing large volumes of content into a document repository can lead to a large number of user searches returning a disproportionate number of irrelevant documents. On the other hand, a conservative approach to adding documents to repositories can lead to under-populated repositories where users do not find useful content. Both these extremes lead to document repositories being perceived as not being useful and a lead to a steep drop in use after the initial spurt in interest (Davenport and Prusak 1998). Further, the value of a repository is significantly based on an evaluation of the value of its content. Contributors thus play a critical role in the success of repositories– not just by contributing content to the repository but also by making the choice of the appropriate content to submit. A greater understanding of user motivations is thus a very important requirement for successful implementation of such repositories.

The following section discusses the theoretical perspectives used to examine knowledge sharing in the IS literature, insights from the public goods literature, and perspectives from social psychology used to study helping behaviors. This is followed by a discussion of the context of data collection and details of data analysis. The paper concludes with a discussion of the results, the implication of the results for theory and practice and suggestions for future research.

¹ Anecdotal evidence gathered by the authors in interviews suggests that users do not provide feedback unless the quality of the content is particularly exceptional or if they notice inaccuracies or interpretations that cause them to question the value of the content.

2. Theoretical perspectives

Why do people contribute?

The content contributed to a repository can be considered a public good since once it is given to a person, it is costless to provide it to everyone else (Bergstrom et al., 1986). It is also difficult to prevent someone who does not pay for the content from using it. An individual may engage in free-riding by not contributing to the repository ever but at the same time enjoying the contributions made by others.

According to economic theory, a rational person will contribute to a repository only if he is provided incentives to compensate for his effort. More importantly, such incentives will work only when the person is recruited for the task, when he is involved in a stable relationship with the repository and when his performance can be monitored (Olson 1967). In public knowledge repositories, however, there is *no* active recruiting. Moreover, because of the large number of participants, it is not possible for a central authority to monitor each individual and provide tailor-made incentives to induce contribution. As against this individualistic view of the contributor acting alone, other researchers consider the contributor as interacting with others within a social context. Public goods theory suggests that a rational person will not contribute unless he has at least an expectation that his efforts would be reciprocated by others (Thorn and Connolly 1987). The broader literature has also identified conditions under which such exchange will occur. However, the features of contexts studied in prior research *are not commonly found in public knowledge repositories*. Prior research has found, for example, that social exchange will occur when individuals know each other, at least in a limited way (Takahashi 2000). We next turn to prior research in the IS literature using the lens of a social context with respect to knowledge sharing in email networks and Usenet bulletin boards.

Examining the use of email for help seeking and giving within one organization, Constant et al., (1996) suggest that citizenship behavior, the desire to benefit the organization was a motive for helping in the online forums created by organizations. In a public knowledge repository, however, the participants are not affiliated to any organization and so would not have the commitment to an organizational purpose that employees would have. The study of online helping in Internet groups by Wasko and Faraj (2000) suggests that altruism, generalized

reciprocity and community interest created by ongoing interaction of the members of these online groups are important motivations. However, unlike in the case of knowledge repositories, participants of a bulletin-board share an understanding and common interests in the topic that the group is devoted to. In a knowledge repository, contributors can come from different backgrounds and have different subject interests. We next look toward a literature that has examined a broader class of behaviors that has many features in common with repository contribution.

Knowledge sharing by contributing to a document repository leads to benefits for others whether or not there are any benefits for the contributing individual. A rich stream of research in social psychology has studied such a class of activities called prosocial behavior (Batson 1998). Much of this research has studied situations in which an individual is unexpectedly called upon to help for a brief amount of time, often called spontaneous helping (e.g., passengers helping an individual who falls in a subway car, Piliavin et al. 1975). The literature has also examined planned helping in the context of kinship relationships, and other situations such as donating to one's alma mater, donating blood and volunteering. We draw upon results from some of this research on prosocial behavior and prior IS research on helping in online contexts to formulate our understanding of contribution to public knowledge repositories.

Altruism is one of the factors that has been highlighted as motivating helping in the literature in volunteering (Clary et al. 1998). Altruism is defined as helping without expecting a direct reward. It is valued by individuals and contributing to repositories might provide a means to express such a value. Social factors such as the esteem of colleagues and other referents, the norm of reciprocity and gratitude towards the collective for assistance received in the past also influence individuals to help (Diamond and Kashyap, 1997). The need for social affiliation and the need for professional self expression are the other social factors linked to helping (Constant, Kiesler, Sproull 1994). While helping driven by altruism and social factors reflects helping without direct benefits, a third factor – career interests – suggests that helpers provide help because of the recognition of the broader link between helping and the advancement of their careers (Clary et al. 1998), and increase in their own economic utility. As opposed to such an extrinsic motivation, prior research (Deci, 1972) has also identified intrinsic motivations that

provide enjoyment for an individual involved in a certain activity, such as helping. The positive reputational benefits such as recognition by peers could also play a role in motivating contributions as well (Shamir 1991).

Prior research in prosocial behavior has examined factors explaining the choice of help given by individuals. Studies of factors that lead individuals to step forward to provide assistance suggest that the nature of assistance provided by individuals is linked to their perception of a sense of responsibility to act (e.g., Berkowitz, 1978). Experiments in situations, where onlookers witnessed incidents where they could step forward to help, indicate that the sense of responsibility that any one person feels for helping is inversely related to the number of other potential helpers (e.g., Piliavin et al. 1975). The overall conclusion of these studies is that the presence of potential helpers diffuses the level of responsibility any individual feels to provide assistance. This has been termed the bystander effect (Latane and Darley, 1970).

Discussions of knowledge repositories consider it almost axiomatic that contributions would be made by experts (Davenport and Prusak 1998). Prior research on prosocial behavior has also shown that people with greater competence were the people who helped more (e.g., Clary and Orenstein, 1991). The mere perception of competence in an individual had been found to increase the likelihood of helping. Promoting the belief that one has the ability to help another individual facilitated the expression of empathy for that individual (Barnett et al. 1985). Empathy has been identified as a key antecedent of the altruistic motive (Batson et al 1981), which in turn leads to helping. In view of the limited exploration of repository contributions, we explore these issues by analyzing qualitative data from a public repository of product reviews and build grounded theory.

What drives the quality of contributions?

As discussed earlier, contributors ensure the success of a repository not merely by contributing content, but also by contributing content of good *quality*. Even if an individual has the requisite knowledge to contribute, it is a moot point whether he would contribute whatever he knows. We propose three hypotheses regarding the quality of contributions, which we test using data from the same public repository referred to earlier.

An expert would be able to distill and apply his knowledge in a particular domain in the form of a contribution that is higher in quality than a contribution written by someone who does not possess the expertise. In the prosocial behavior literature, the perception of competence was found to lead to an increase in duration and magnitude of help (Harris and Huang, 1973). We therefore advance the following hypothesis:

Hypothesis 1: The more the perceived expertise of an individual, the higher the quality of the contributions he makes to a repository.

Writing a good quality contribution can be a challenging task for many people. In order to achieve a certain standard of writing, an individual might have to learn by watching others perform the activity. According to social learning theory (Bandura 1977), reproduction of such learning by observation is more likely when the individual is involved within the group. By watching the contributions of other participants and admiring their contributions, even if they offer no immediate benefits to him, the individual is more likely to learn the contributing behavior himself. As he imitates them and strives to live up to the standards of the contributors in this referent group, his quality will also begin to match theirs. Thus, we propose the following hypothesis:

Hypothesis 2: The higher the quality of contributions written by those in the referent group of an individual, the higher the quality of the contributions he makes to a repository.

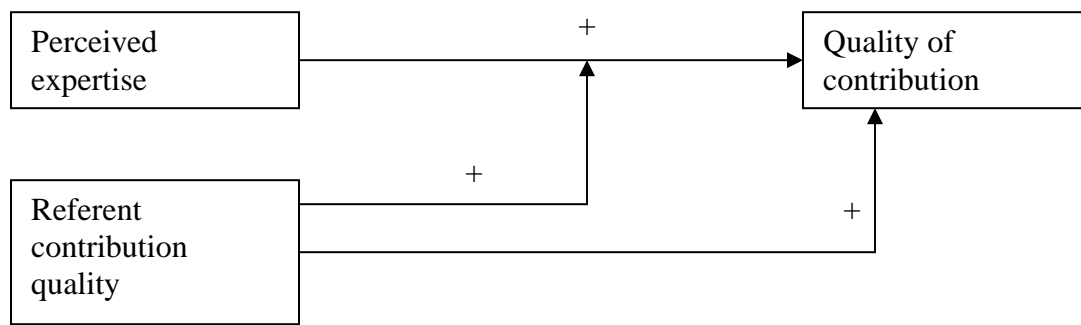
An individual who has expertise in a given area may not necessarily contribute all that he knows. Unlike in an email or bulletin-board network, as noted earlier, there is no request in a repository system asking for knowledge on a specific topic. As a result, there is not even an approximate indication of the level of quality required of the contribution. If an individual were to make a contribution without the knowledge of who else is making contributions and what they contributing, he would tend to write something that he thinks passes muster. Other things being equal, such contributions would vary from the lowest to the maximum quality that matches the potential of this person.

However, knowledge has been defined as justified true belief (Nonaka 1994). Thus, documenting one's knowledge by contributing to a repository is a form of expressing opinion. Justification of one's opinion (say, about a good way to program a certain task in Java) is achieved by a process of logical argument and by mustering evidence (say, by describing the processing times of different algorithms). Such justification can vary in focus and sophistication and therefore differ in quality.

If an individual considered himself as part of a certain group of people who shared similar opinions, he would begin to compare what they say in their contributions with his own views. According to social comparison theory, people have a drive to evaluate both their opinions and their abilities (Festinger, 1954). By writing contributions to a repository, an individual can evaluate invite such evaluations from other participants in his referent group and therefore potentially confirm and gain support for what he has to say. So the quality of contributions would tend to be aligned with those of contributors in his referent group. Thus we hypothesize that,

Hypothesis 3: The higher the quality of contributions written by those in the referent group of an individual, the greater the effect of his expertise on the quality of the contributions he makes to a repository.

The above hypotheses area depicted in the figure below:



We examined the above questions using qualitative and quantitative archived data on reviewers and their contributions to the review repository at Amazon.com. By focusing on contributions to one repository, we expect to eliminate confounds from the characteristics of the user interface and features provided by different technology underlying repositories.

Amazon.com repository is visited by over 14 million users every month. Customer reviews of products displayed on the screen are just one click away – drawn from the online repository by a search when the user clicks for more information. Amazon provides the facilities for any individual to sign up and contribute reviews of books, music, videos and other products sold on the site. In writing a book or music review and posting it on the Amazon.com site, reviewers share their opinion on these products with other users of the repository – information that they believe may be useful in helping the users decide if the book or CD is worth reading or listening to. The reviews are moderated – Amazon.com employs a small group of editors who delete inappropriate or offending content from reviews. Amazon.com allows a reviewer to develop and track a referent group by creating a “Favorite People” list. When one of those people in this list writes a review or recommends something, Amazon puts it in the individual’s customized “Friends and Favorites” home page. This allows the reviewer to keep track of members in his or her referent group and their opinions. Amazon also provides a bulletin board for discussion among reviewers giving a reviewer and his referent group another forum to communicate.

Contributing reviewing to the Amazon repository is not compensated – it is entirely voluntary. However, Amazon ranks reviewers using a composite of the number of reviews submitted and the average number of helpful votes received by reviews. The possibility of recognition as a valued reviewer represents the only formal incentive offered to contributors. Amazon.com also provides all reviewers the facility to create a personal page on the site with a photograph and up to 4000 characters of information on themselves.

We collected detailed profiles of 1000 reviewers – the set comprising the most prolific reviewers and the most helpful reviewers. The profiles contained rich personal details that contributors revealed about themselves. This often included personal details such as where they lived, how old they were, details about their families and pets, descriptions of their professional careers, information on their hobbies, their interests, their passions and pet peeves, the factors motivating them to write reviews, personal life history, their favorite books and the music that they liked².

² Amazon.com provides a standard template for the profile information but most contributors sampled had chosen to use their own format.

Providing profile information is voluntary, some contributors had opted to provide only their name and nothing else. Most contributors however provided a broad range of details about themselves and their motivations. A representative profile is in Appendix –1.

For testing our hypotheses on the quality of contributions, we focused on the top 1000 reviewers. To measure the *perceived expertise* of a reviewer, we counted the number of other people in the Amazon community who considered him or her a friend by including this reviewer’s name in their “favorite people” list. We operationalized the *quality of a reviewer’s reviews* by counting the total number of helpful votes received by this reviewer and dividing it by the number of reviews he had written so far. Finally, we measured the *referent contribution quality* by taking the average helpful votes per review of each of this reviewer’s friends and calculating an average of those numbers.

Analysis

In analyzing the qualitative data, we followed the techniques of open coding and axial coding advocated by Strauss and Corbin (1990). We used open coding to categorize the text in the reviewer profiles into categories suggested by prior theory. We identified keywords suggesting the different category of motives such as reciprocity and self expression and enriched this set with keywords we encountered in instances of behavior driven by such motives. We thus used explanations derived from theory as well as those suggested by the data. Second, after coding the data, we grouped the categories that reflected similar concepts and themes, consistent with the notion of axial coding. These steps highlighted the core phenomenon of the motivations underlying contribution of reviews and we used the linkage between the categories to infer the theoretical explanation. In addition, an alternate coder coded a random set of profile texts drawn from the sample independently using the categories drawn up by the first coder. Second, the alternate coder examined a random set of categories and examined the profiles listed under each of the categories to confirm if the profiles warranted classification under that category. These procedures also ensured validity (ensuring accurate interpretations), and reliability (consistency of the interpretations) of the conclusions drawn from the data (Yin, 1994).

We analyzed the quantitative data using regression analysis, with *perceived expertise* and *referent group quality* as independent variables and *quality of reviewer's reviews* as the dependent variable. To test the moderating effect of hypothesis H3, we included a multiplicative term of the two independent variables in the regression equation.

5. Results

Why do people contribute?

The 1000 reviewers in the sample had each contributed an average of 150 reviews. The most prolific reviewer had contributed 3146 reviews; the top five each contributed over 1000 reviews. However, the majority of the contributors were clustered around the mean. Reviews written by contributors received an average of 884 helpful votes. Most of the reviews were from reviewers in the USA.

Expression of altruism:

Our coding of the reviewer profiles revealed altruistic motives in sentiments such as “become noble”, “because of compassion” etc., in 136 (13.48 %) of the sample.

By recommending or criticizing products sold on Amazon, a reviewer is saving the readers of his review the cost involved in searching for good products. By sharing one's experience with the use of a product, a reviewer is making it easier for a reader of his review to make a purchase decision. The following excerpt from a reviewer profile shows an example:

“Wanting to help is the primary reason I write book reviews on Amazon.com. Most people don't have enough time to read so I want to be sure that people know which books can help them, and which cannot, and for what purposes. I also like to point out the bigger questions that sometimes the books and other reviewers fail to articulate.”

Utilitarian motives

In contrast to altruistic motives, fewer reviewers (29, 2.87%) stated “selfish” motives to explain why they wrote reviews, e.g., “monetary gain”, “promote one's business”, etc. A socially undesirable quality such as selfishness would not tend to be concealed as a motive when writing

one's profile because of response anonymity (Aquilino, 1998). Thus we can consider this figure as a reasonable indicator of the utilitarian motive.

Each of the above motives involves obtaining a material benefit in return for contributing reviews. The benefit could be tangible (in the form of free products, or money), or reputational wherein the reputation leads to tangible benefits in other ways to the contributor. A correlation between the number of reviews and the number of helpful votes per review for each reviewer yielded a value of -0.218 (significant at the 0.01 level). One would expect that people would contribute in the hope of obtaining positive feedback from others. However, we find not only that there is no positive correlation between reviews and helpful votes per review, but also that the relationship is negative. This shows that reviewers are on average not being motivated by hopes of positive feedback for their reviews.

Reciprocity

Individuals indicated that they wrote reviews in return for the benefit they had received from other reviewers in the past. We coded reciprocity as a motivation by mentions of norms of conduct, obligations and trust and from statements reflecting affect towards the community. 49 reviewers (4.86%) indicated reasons such as “benefited from reviews written by others”, and “helping others in repayment for help received in the past”.

For example, some reviewers indicated that:

“I got started reviewing because I enjoyed reading lots of other people's reviews to choose a book.”; “I have consulted Amazon's public reviews for years before making a purchase and I decided to start giving back to the Amazon community”; “I know I read these reviews prior to buying any book and they have been excellent help, so if I can steer someone to one they will enjoy, well, then I've paid my dues.”

Knowledge motive

Some individuals (58, 5.75%) indicated motives directed toward developing oneself to explain why they contributed reviews as: “sharpen thoughts by articulation” and “chronicle what I have seen, heard or read”. These responses indicate that the activity of contributing a review an individual can improve one's writing skills, organize and clarify the content of one's thoughts

about the subject, and provide an avenue for enjoyment. As one of the reviewers said in his profile:

“I write reviews on Amazon.com's website for two reasons: first, to clarify and organize my own thoughts and second, to assist others in selecting worthwhile reading material”.

Choice of content contributed:

We also found that people tend to choose areas to contribute in based on the contributions made by other reviewers. We coded 64 profiles (6.34%) into the categories such as e.g., “bring awareness about products that customers may not otherwise learn about” based on statements saying that the reviewer chose to write about products that nobody (or a few people) had reviewed, or had provided inadequate reviews in their opinion.

In the above responses, contributors are stating that they tend to contribute reviews about a particular book, CD, toy etc. (or in a particular area such as, e.g., art in the Middle East) for which few (or no) other individuals have made contributions. Even if others have contributed reviews, an individual tends to contribute his own review only if he feels that the existing reviews in that area are inadequate in some way. An example of this can be seen in the following excerpt from a profile:

“I try to review items that have no reviews, especially if there is no publisher description. I want to encourage readers to try some of the more obscure titles that I enjoy. You may note that most of my reviews have no feedback ... that is, at least in part, because few people wander into these wonderful bycorners of literature/theology/folklore. Do I read more conventional books? Yes, but if there are already reviews that approximate what I think needs to be known, I don't bother to review them.”

Tapping helpers versus tapping experts

As expected, we did find instances of reviewers writing about subjects in which they were experts. In our detailed reading of the profiles of the top 1000 reviewers, we found an individual with a PhD in statistics who reviews only books on statistics and a house construction / repair contractor who writes only about tools and hardware. Many of the reviewers also stated that they were writers of books/plays/songs, musicians, performing artists, moviemakers, thereby

indicating some level expertise in their respective areas in which they wrote reviews. For example, among the reviewers we had editors (3.35%), consultants (3.35%), and authors / composers (7.3%).

On the other hand, we also observed that many reviewers wrote on topics that were not focused on one area of specialty. Amazon classifies the various products it sells into broad categories such as books, music, videos, toys, and electronics. Each of these categories has subcategories. Among 50 reviewers ranked 1-10, 101-110, 251-260, 501-510, and 1000-1009, the average number of sub-categories in which a reviewer contributed reviews was 13.72 (median 12). We also computed the mean and standard deviation in the measure of perceived expertise for the top 1000 reviewers used in testing the three hypotheses on quality of contribution, to be 6.36 and 10.03 respectively.

Expertise is usually built after continued working in one or a few related domains (Bereiter and Scardamalia, 1996). As a result, the fewer the number of categories in which a reviewer writes reviews, the greater the expertise that he or she can be said to have in those areas. The large variation in the number of categories reviewed by reviewers, and of the perceived expertise scores of the top 1000 reviewers indicates that there is a mix of both experts and non-experts.

In addition, many reviewers indicated that they were striving to attain expertise in areas such as performing arts, movie-making, and music, and saw writing reviews as a means to develop expertise. For example, 91 individuals (9.02 %) aspired to be experts in writing skills and did not see themselves as experts currently. This is illustrated by the following comments made by some reviewers in their respective profiles:

“I don't profess to be an expert at anything. In fact, I've always been something of a professional dilettante (sic). I write the reviews to help others make some kind of judgement about whether they want to spend the money I did on a book.”

“I am not an expert in any of those subject areas, but I don't feel I'm boasting when I say that my reviews of non-fiction books in these areas are more than just rantings”

“I don't claim to be an expert, but I am familiar with a great deal of music, and hope I can identify a cd's strong points and identify the type of listener who will enjoy it.”

This suggests that the repository of reviews incorporates contributions by both experts and non-experts and not just by experts alone.

What drives the quality of contributions?

Our regression analysis shows that hypothesis both hypotheses H2 and H3 are supported. However, we find that H1 is not supported, i.e., there is no significant relationship between the perceived expertise and the quality of reviews written by an individual. This implies that the expertise of a contributor is not enough. The members of an individual’s referent group influence the quality of content contributed by him. In addition, the more the expertise of a potential contributor, the greater the effect of his referent group on his own contribution quality. Thus, though expertise by itself does not seem to have a direct bearing on contribution quality, its impact is brought upon the members of the individual’s referent group.

Variable (Dependent / Independent)	Standardized coefficient
Contribution quality (DV)	
Perceived expertise (IV)	-0.08 (-0.85)
Referent contribution quality (IV)	0.082** (2.10)
Perceived expertise X Referent contribution quality (IV)	0.187* (1.87)
Adjusted R2	0.026
F-statistic	10.02***

(*: significant at p<0.001, **: significant at p<0.05, *: significant at p<0.1)**

Discussions and Conclusions

In trying to understand the reasons why people might contribute to document repositories, we study a large, public, and well-known repository of product reviews. In this first-time field exploration of the phenomenon, we use the profiles that the contributors of the reviews have written about themselves as a source of data to glean their motivations. Our findings are discussed below:

First, our above findings suggest that a variety of motivations can drive individuals to contribute to a knowledge repository. This is consistent with the functionalist perspective in psychology, which holds that people perform a certain activity because it serves one or more functions (Snyder and Cantor, 1998):

- a) Value-expressive: an activity may allow an individual to express his / her personal values and to his / her concept of self. Contributing to a repository can be a way of expressing one's values about altruistic concern for others;
- b) Utilitarian: a certain behavior may result in rewards from the person's external environment. So a person might contribute to a repository in order to receive monetary or other rewards;
- c) Social adjustive: doing a certain thing may lead an individual to better fit in with his / her peer group. Contributing to a repository, for example, can offer a way for an individual to be and socialize with other participants there, and reciprocate the benefits he receives from them;
- d) Knowledge: by engaging in particular task, an individual might have a new learning experience, and be able to exercise one's knowledge, skills and other abilities. Writing a contribution for a knowledge repository can be just one such example of an activity that allows a person to put down, organize and improve one's thoughts about a specific topic.

Unlike the perspective of economic theory (in particular of public goods), we see that it is not just reciprocity or utilitarian motives that drive contribution to repositories. The results also clarify the nature of the intrinsic motivation that has long been studied in IS literature. In the context of repositories, it springs out of the knowledge motive described above.

It is likely that a particular feature of a knowledge repository system will be critical in motivating particular individuals to contribute because that feature serves a function that is salient for them. Having a range of such features increases the likelihood that at least one feature will serve a motivational function of different individuals and therefore encourage them to contribute.

Second, a potential contributor will be more likely to contribute in an area that has little or no other contributions from others. This observation qualifies the finding of Thorn and Connolly (1987) whose model leads to reduced contribution as the overall number of participants

increases. Our study, instead, finds that contribution decreases only with increase in number of contributors in a given domain.

By providing a wide variety of topics in which individuals can contribute to the repository, and highlighting those that have little or no contributions, a repository system might be able to induce more contributions. The system might even leverage the bystander effect by having a “call for contributions” for a period of time in which potential contributors are not informed how many contributions have already been made in a particular topic. So long as a potential contributor does not know if many other individuals have contributed, he / she is more likely to contribute.

Third, the presence of a large number of non-experts among the reviewers on Amazon suggests it does not take too much expertise to sustain a thriving knowledge repository. It is likely that the non-experts are using the forum to organize and archive their own thoughts, and thus improve their own knowledge. This is attested by the statements listed under the “knowledge motive” section above.

In addition, each individual has different requirements for knowledge on a particular topic. Individuals vary in their absorptive capacity to assimilate knowledge of different kinds on the same subject (Cohen and Levinthal, 1990; Szulanski, 1996). For example, for a novel by Stephen King, an individual who is new to the genre would look for different kinds of information as opposed to someone who is familiar with that line of books. Such a variation in need for information calls for reviewers with varying levels of expertise.

This observation among reviewers also goes against the finding from the model developed by Thorn and Connolly (1987). Their model suggests that information asymmetry leads to reduced contribution. Sender asymmetry exists when “some participants have access to better information than others” (p. 518), i.e., when some are more expert than others. User asymmetry exists when “some stand to benefit more from information of a given quality than do others” (p. 518), i.e., when participants have different needs for knowledge. Assuming that only the “hope for reciprocity” is a consideration for participants, Thorn and Connolly argue that an individual will contribute only when he expects to receive information of identical quality from others. At

Amazon, differences in expertise among reviewers would lead to sender symmetry. Different shoppers are looking for different information in reviews leading to user asymmetry. However, our study shows that since participants contribute because of considerations apart from reciprocity, asymmetry in knowledge levels can actually induce more contributions to the repository.

To encourage individuals with varying levels of expertise to contribute to the repository, the repository system might be designed to help them organize their contributions in terms of topics and keywords. It might also aid potential contributors by providing a template for making contributions.

Finally, our study shows that a contributor's expertise is not the only factor that determines the quality of his contribution. By providing a standard to compare against, the quality of contributions made by his referent group of contributors also plays an important role.

Limitations:

First, we conducted this exploratory study at only one site, the Amazon.com repository of product reviews.

Secondly, we did not ask the reviewers specific questions about why they contributed. Rather, we culled out their motivations from whosoever had mentioned their motivations in their profiles. As such, we might have missed out some factors that might also be relevant to the contribution activity.

Future research:

The findings in our study call for further theoretical development of the factors causing individuals to contribute to knowledge repositories. They can then be tested on participants of knowledge repositories in organizational settings. A similar theoretical model might also be used to study knowledge sharing in other forms of online networks, such as bulletin boards, and knowledge directories.

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Appendix 1

Mr. D

Reviewer Rank: 23

A very good reason to write reviews for Amazon.com is to share ideas with others. As a writer I find I have a much better understanding of what I have read when I write about it. Additionally, when I write about a book I enter into a dialogue, however distant, with the author. Most books I read are excellent, and even the flawed ones have much that is valuable. Writing a book is a long and sometimes lonely process full of uncertainty and doubt. When the book is finally published after several years of work there is a sense of accomplishment immediately followed by a let down. Most books are published and quickly go out of print. Their authors sometimes wonder, was it worth all the time and energy, especially when they get superficial reviews from professionals who often do not have time to actually read the books they review. 'It fell stillborn from the press' is an old book business cliché and lament, and it is also sadly often the truth.