Asked and Answered: On Qualities and Quantities of Answers in Online Q&A Sites

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Abstract

Social question and answer (Q&A) sites receive tens of thousands of questions each day, producing a mix of archival information, asker satisfaction, and, sometimes, frustration. This paper builds upon several recent research efforts that have explored the nature and qualities of *questions* asked on these social Q&A sites by offering a focused examination of *answers* posted to three of the most popular Q&A sites. Specifically, this paper examines sets of answers generated in response to specific types of questions and explores the degree to which question types are predictive of answer quantity and answer quality.

Blending qualitative and quantitative methods, the paper builds upon rich coding of a representative sets of real questions — drawn from Answerbag, (Ask) MetaFilter, and Yahoo! Answers — in order to better understand whether the explicit and implicit theories and predictions drawn from coding of these questions was borne out in the corresponding answer sets found on these sites.

Quantitative findings include data underscoring the general overall success of social Q&A sites in producing answers that can satisfy the needs of those who pose questions. Additionally, this paper presents a predictive model that can anticipate the archival value of answers based on the category and qualities of questions asked. And this paper offers data suggesting significant variation in the patterns of use and types of questions that characterize each site, with, for example, Metafilter's Q&A community exhibiting a strong bias toward answering factual and prescriptive questions (i.e. questions seeking an existing solution to a recognized problem or challenge) while Answerbag's community shows a bias toward social and conversational questions and answers.

Qualitative findings include an analysis of the variation in responses to questions that are primarily seeking objective, grounded information relative to those seeking subjective opinions. Additionally, we offer possible reasons for Metafilter's striking success (relative to its peers) in producing answer sets that are likely to be judged as satisfying the questioner's needs and as having significant archival value. While these metrics do not suggest that Metafilter is the "best" of the three sites, our findings do point towards Metafilter's focused community as offering distinct advantages for certain types of question and answer exchanges.

Introduction

Tens of thousands of questions are asked and answered every day on social question and answer (Q&A) sites. These questions exhibit a striking range of types; some will ask questions seeking a purely factual answer, while others might ask for advice solving a personal problem. One person will ask whether Kanye West's latest album is his best, while another will seek help solving a problem with the keyboard of the computer being used to write the question.

But the differences among question types can be subtle. For example, if someone asks: "Which film won the Best Picture Oscar in 1977?" there is only one right answer: *Annie Hall*. If, by contrast, someone asks: "What film *most deserved* to win the Best Picture Oscar in 1977?" there are many possible answers, most of them as functionally "correct" as any other. Finally, if someone asks: "How could *Star Wars* not have won the 1977 Best Picture Oscar?" that questioner is implicitly inviting conversation about – and appreciation of – that George Lucas film. Despite all three questions superficially sharing a topic – the 1977 Best Picture Oscar – we interpret each question to be functionally different in the types of answers and exchanges it anticipates (*see also* Pomerantz 2005).

Better understanding these distinctions — and the answering patterns that accompany them — is central to the development of more responsive interfaces for social Q&A sites.

(a)	SUBJECTIVE				OBJECTIVE	
(b)	**Deliberative** *(future-focused)*		**Epideictic** *(present-focused)*		**Forensic** *(past-focused)*	
(c)	**Advice**	**Identification**	**(Dis)Approval**	**Quality**	**Prescriptive**	**Factual**
(d)	Directed at generating a new (or specifically tailored) solution, approach, or plan rather than locating or implementing an already existing solution. Grounded in the questioner's desire to inform future action.	Directed at establishing a focused discussion (and potentially building relationships) among people with a shared commitment to a topic.	Directed at encouraging readers to offer a "favorite" or "least favorite", with the implicit understanding that answers will be – at root – subjective opinions.	Directed at seeking the "best" or "worst" example of a given class, or at weighing the relative merits of a given product, item, or concept, with the implicit understanding that answers will be – at root – objectively grounded.	Directed at pursuing an already developed solution to a problem or challenge. Grounded in the questioner's desire to learn steps or strategies that are known (through experience) to address or resolve the issue at hand.	Directed at seeking an answer that is typically considered objectively or empirically true, such as existing information, data, or settled knowledge.
(e)	My parents say that playing "The Beatles: Rock Band" is a waste of time. How can I persuade them that it will actually help me learn to play music?	What's the next band you want to see get a Rock Band "special edition"? I wish they would do the Ramones. I would want to be Dee-Dee. Who would you be?	What's your *favorite* Beatles song?	What's *the best* Ramones Song?	I've heard there is an Easter Egg in "The Beatles: Rock Band" where you can play "Eleanor Rigby" but I haven't been able to find it. How do you unlock the song?	Will my controllers for the Wii version of "Guitar Hero" also work on the Wii version of "The Beatles: Rock Band"?

Table 1. Harper et al.'s [2010] rhetorical taxonomy of question types

Recent studies of social question and answer (Q&A) sites have examined the varying types of questions in order to better understand and improve user behaviors and community outcomes. The field is accumulating results that demonstrate a range of important properties for questions that have implications for researchers and site designers. For example, one recent study compares two similar Q&A sites to examine the effect of being "socially conductive" in questions, and then investigates whether or not users report enjoying the experience more and are thus more likely to continue using the system (Hsieh and Counts 2009). Another study compares five sites and finds that different types of questions elicit different amounts of effort from answerers (Harper et al. 2008). The process of selecting "best answers" also varies depending on the type of question (Kim, Oh, and Oh 2007). Not surprisingly, information-seeking questions place higher value on clarity and accuracy, while more subjective questions value accuracy, while more subjective questions value agreement and emotional support.

Prior work has also studied user's answering behavior in social Q&A sites from several perspectives. For instance, (Chen 2005) and (Harper et al. 2008) conduct field experiments to investigate question-level factors that influence the quality of the resulting answers. These studies show that financial incentives have mixed effects, leading to *more* answers but not necessarily *better* answers. We extend these studies by looking more deeply at the rhetorical and linguistic properties of the questions and answers in social Q&A sites to both pursue and clarify links between question quality and answer quality.

Other recent work has investigated user motivations to ask questions and provide answers (Morris 2010, Dearman 2010). This work has yielded rich qualitative results about the decision-making process of users. We extend this work

by building quantitative analytical models to better understand the relationship between questions and answers from a data-driven perspective.

Harper et al.'s (2009) basic separation of questions into "conversational" and "informational" questions, led to our broader recognition of more subtle differences in these question types. Other studies clustered questions into three groups: "discussion forums", "advice", and "factual", based on structural factors such as the number of answers and the length of the question (Adamic et al. 2008).

This paper builds on work identifying and clarifying question types in order to examine the characteristics and patterns of answers on three leading Q&A sites. A refined understanding of how these types of questions behave, and how answerers respond to them suggests that machine learning and other forms of automation might be useful in Q&A sites.

This taxonomy of question types allows us to quantify what types of questions are being asked in what proportion, giving us a kind of "fingerprint" for each Q&A site and pointing us towards what each site's users might find most beneficial.

Having examined the questions and accumulated data speaking to their potential for producing various types of value, we now turn to the answers, to test our hypotheses and improve our understanding of the Q&A sites.

Research Goals

The aim of this research is to deepen our understanding of the quantities and qualities of answers provided to questions that are asked online. We organize this contribution around three primary research goals:

Goal 1: Determine what set of factors that are properties of questions might predict number, quality, or archive worthiness of answers.

A team of scholars with expertise in both rhetorical studies and computer science worked to examine the answers to three hundred questions that had already been sorted into the above-cited six way taxonomy of online questions. By examining the answers, we could gauge what effect question type had on number of answers, on quality of those answers, and of archive worthiness of the threads as a whole.

Goal 2: Determine whether answers follow questions in predictable patterns; whether better questions lead to better and more answers.

Given the predictions we have from prior research as to which questions are most likely to receive more and better answers, we assess whether the results presented as they were expected or if there were surprising results.

Goal 3: Determine what factors of the Q&A websites cause some sites to have more and better answers than others.

Having coded completely blind as to which site the questions come from – both when coding questions and when coding answers – we observe striking differences in quality and quantity of answers according to site. We examine potential factors that might account for these differences, including the distribution of the questions across the taxonomy, and community-building behaviors.

Methods

To examine the quality of answers in online Q&A sites, two co-authors of this paper —scholars in the field of rhetoric— hand-coded the answers to 300 questions. These questions were originally chosen at random from the data set reported in (Harper et al. 2009) which contains several years of question-and-answer exchanges from three popular Q&A sites: Answerbag, (Ask) Metafilter, and Yahoo! Answers. These two rhetoricians hand-coded these questions into the question types (Harper et al. 2010), so that answers could be cross-referenced with the question types.

Figure 1. Coding tool used to code answers (showing coding screen for the thread as a whole).

The coding process was facilitated through an online tool (Figure 1) that represents the text of questions and answers neutrally, blinding the coders to potential bias based on their existing knowledge of the three Q&A sites. The coding tool asks coders, on a scale of one to five, to rate four different features of each answer: 1) the extent to which an answer references earlier answers; 2) the value of each individual answer to the question; 3) the value added to the conversation; and 4) the length of time that the answer would likely remain valuable. We then asked how the combined pool of answers, when viewed as a set, performed on three measures: 1) fulfilling the needs or expectations of the questioner; 2) generating archive worthy knowledge; and 3) building community within the given site.

The two expert coders independently scored the answers to each question (coding an average of 8 answers per question). The disagreement the coders had as to what counts as a 1 and what counts as a 5 were handled through a normalization of the scores, allowing us to see the average values given to the answers for each of the above criteria.

Descriptive Results

We have 300 ratings provided by 2 expert coders. The correlation between the coders is:

q1: "Fulfillment"	q2: "Archivability"	q3: "Community"
0.74	0.70	0.38

Table 2. Coder correlation across questions

We notice that the two coders strongly agree on question 1 ("how much has the thread contributed to fulfilling questioner's needs or expectations?") and 2 ("how much has the thread contributed to archive worthy knowledge?") but not on question 3 ("how much has the thread contributed building community?"). We average the ratings of the two coders and use that for further analysis in the paper. Figure 2 shows the rating distribution into three buckets.
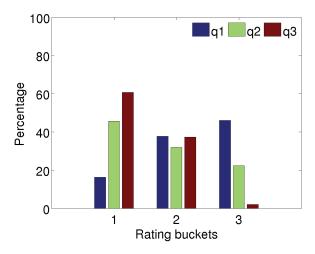

Figure 2. Overall distribution of coding for thread-level questions into low/medium/high buckets.

The bucketing strategy that we choose places ratings {1, 1.5, 2} in bucket 1, {2.5, 3, 3.5} in bucket 2 and {4, 4.5, 5} in bucket 3. We observe that most answer sets fulfill questioner's needs or expectations, but that generation of archive-worthy knowledge is comparatively rare, and community building is even more rare.

Figure 3 shows this rating distribution per site. We can observe that Metafilter's performance is easily distinguishable from the other two sites. Our coding suggests that Metafilter's answer sets are dramatically better at fulfilling questioners' needs; that they generate more archive-worthy

knowledge; and that they promote community-building significantly more often than Answerbag or Yahoo! Answers.
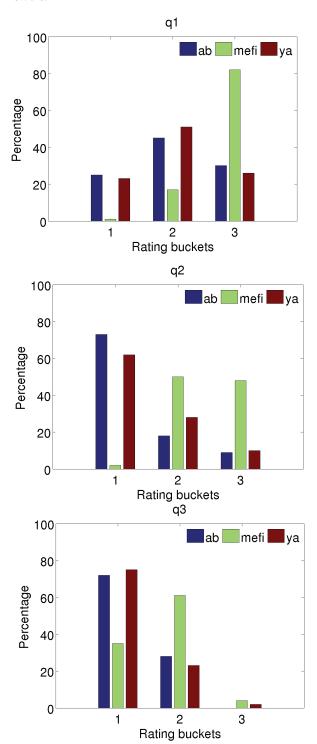

Figure 3. Coding (in buckets) by question and site.

Quantitative Analysis: Regression Model

We use regression analysis to investigate the relationship between the properties of a question, and the resulting quality of responses. We build regression models from coded and structural properties of the question:

Structural Properties of Questions

- **Site** (Answerbag, Metafilter, or Yahoo!)

- **Question length** (measured in characters)

Coded Properties of Questions

- **Type** (Advice, Identification …) – built from the consensus primary question type, as discussed by two expert coders.

- **Is a compound question** – built from the average response from seven student and two expert coders to the question "does this submission contain more than one distinct question?"

- **Is revision good** – built from the average agreement from seven student and two expert coders to the statement "I think this question will receive more or better answers if it is revised."

- **Is personalized good** – built from the average agreement from seven student and two expert coders to the statement "Is this question highly personalized with regard to the asker's situation, completely independent of the asker's situation (generic), or somewhere in between."

- **Has archival value** – built from the average agreement from seven student and two expert coders to the statement "I think high–quality answers to this question will provide information of lasting/archival value to others."

- **Has lasting value** – built from the average agreement from seven student and two expert coders to the question "how long will it be before this question and its answers become outdated?" (week, month, year, decade, indefinitely)

- **Is emotional** – built from the average agreement from seven student and two expert coders to the statement "I think the question asker is emotionally invested."

The intent of separating archival from lasting value is to distinguish between whether answers to a question are likely to be seen as valuable by others (archival value) and how long they will be relevant, even to the questioner (lasting value). The question "What are the names of the pitchers who pitched in relief for the Giants in the 1954 World Series" would be coded as high on both scales, because it is likely to be interesting to others and won't go out of date. "Who's the secret guest star on tomorrow's 'Tonight Show'" would potentially be highly in archival value (if many others care about it), but low on lasting value (it isn't interesting two days later, when the secret is out).

We first ran a regression analysis to determine which properties of a question lead to *asker fulfillment*. The regression model is not especially predictive, achieving $R^2=0.28$. Of all the variables, only the site of the question is a significant predictor ($p<0.01$) of fulfillment: Ask Metafilter has a positive effect (mean fulfillment: 4.29), compared with the other two sites (mean fulfillment: Yahoo! = 2.98, Answerbag = 3.02).

We built a similar model to predict *archival value*. This time, the regression model is more predictive, achieving $R^2=0.59$. The site, type, and coding of the longevity of the question all are statistically significant factors ($p<0.01$ for all three). When a question is asked at Metafilter, this model predicts it will achieve greater archival value (mean coded archival value: Metafilter = 3.25, Yahoo! = 2.14, Answerbag = 2.05). The model also predicts that Identification and (Dis)Approval questions will achieve lower archival value, while Prescriptive and Factual questions will achieve greater archival value (mean coded archival value: prescriptive = 3.50, factual = 2.82, identification = 1.53, (dis)approval = 1.11).

Questions coded to have greater lasting value also wind up with greater archival value. The coded archival value *of the question* is marginally significant ($p=0.07$) (and positively correlated), as is the length of the question in characters ($p=0.07$).

We conducted a similar analysis to understand the relationship between the number of answers a question gets and the quality of answer outcomes. In this case, we re-use the models described above, adding the number of answers to determine how much of a predictive boost is achieved with this new variable.

In the case where we are interested in predicting asker fulfillment, the number of answers a question receives is a statistically significant variable ($p<0.01$). More answers is positively correlated with better fulfillment scores, and boosts the model's R^2 from 0.28 to 0.36. However, in the case where we are interested in predicting archival value, the number of answers is not statistically significant.

Discussion

Question Properties and Their Effects on Answers

In the process of aggregating the above-cited datasets, we also observed significant patterns and trends that may be of use to others working to better understand the dynamics of question-and-answer exchanges in social Q&A sites.

The Significance of Subjectivity/Objectivity

The six-way question taxonomy can be divided in a number of ways in order to analyze particular elements of questions and answers, but at its center the taxonomy offers a

dividing line between questions that — at root — seek subjective opinions (the Advice, Identification, and (Dis)Approval categories) and those that seek comparatively objective information (Quality, Prescriptive, and Factual). We find the behaviors of these two larger groupings of question-and-answer exchanges to be different in striking ways.

First, from a flat numeric standpoint, the 133 questions with primary types in subjective categories generated 1,491 individual answers, for an average of 11.23 answers per question. By contrast, the 147 questions with objective primary types generated only 928 answers (only 6.31 per question). This gap is, perhaps, to be expected. Any Yahoo! could have an opinion, but a comparatively limited group of people might know or have access to the objectively grounded information solicited by questions falling into the Quality, Prescriptive, and Factual types.

But even though the questions in the subjective categories generated significantly more answers (almost twice as many) this did not consistently translate into more fulfillment of the questioner's needs and expectations or the generation of more information of likely archival value. When we evaluated whether questioner's needs or expectations were met, questions in the subjective categories averaged 3.277 on a 1-5 scale, while questions in the objective category averaged 3.541. We pause briefly here to underscore that — as suggested by previous work in the field — the overall quality of answers to individual questions, when measured in terms of the overall pool of answers to each given question, is impressively high.

When we evaluated questions in terms of their likely generation of archival information, questions in the subjective category averaged only 1.789 on the 1-5 scale, while questions in the objective category averaged 3.085.

These patterns correspond closely to our own understanding of the inherent properties of some of these question types. Identification questions are often overtly directed at generating the kinds of ephemeral discussions analogous to those found in bars or cafes. (Dis)Approval questions are overtly calling for subjective opinions. Both of these categories may well be "stalking horses" of sorts for those hoping to build social connections with others online who share their perspectives or interests. Thus, by their nature, Identification and (Dis)Approval questions are often not overtly directed at the production of information likely to retain its value over time, but instead are directed at social interchange. By contrast, questions that promise to produce either a set of steps to address a specific problem (in the case of Prescriptive questions) or a scrap of information that might otherwise prove hard to identify or locate (in the case of Factual questions) would tend to promise to produce information that will remain valuable over time, and

social interchange would tend to be ancillary in answers to these question types.

Site-Specific Properties of Q&A Exchanges

As our answer data accumulated, it became increasingly clear that there were pronounced differences among the three sites (Metafilter, Yahoo! Answers, Answerbag).

Superficially, the three sites are hard to distinguish from one another. They all are directed at "pure" Q&A exchanges, whereas one of their leading competitors, Answers.com, has folded in wiki functionality and tethered question-and-answer exchanges to reference materials on the site like a dictionary and a thesaurus. In the three sites examined in this project, the structure of exchanges is comparatively simple. A questioner asks a question, and as many or as few readers who choose to do so offer responses.

The Q&A sites first present distinctive patterns in relation to our favored question taxonomy. Previous work on this dataset showed significant variation in the types of questions most commonly asked on each of the three sites (*see* Harper et al. 2010) Having coded 100 question-and-answer exchanges from each of the three sites, we can now observe that these patterns are confirmed and intensified when paired with data on the properties of the answers.

Answerbag's questioners tend to ask more social, subjective, and future-directed questions. Metafilter's questioners, by contrast, tend to ask more objective, past-directed questions. Yahoo! Answers, represents a relatively balanced spread of questions across types. These patterns suggest that the communities that develop on and around these sites have different goals and desires . . . in effect different *personalities*.

Community Effects?

Some of our findings appear to be driven by structural differences among the sites. Of the three sites, Metafilter has the most gatekeeping. Members pay a one-time $5 charge to join the Metafilter community, and only community members are allowed to ask or answer questions. These questions, in turn are more likely to be answered, more likely to produce anticipated satisfaction for the questioner, and more likely to reflect the answerer's awareness of the larger community of the site. These questions showed the most community awareness, but also tend to fall more on the objective side of the objective/subjective split.

By contrast, Answerbag allows complete anonymity; a person can ask or answer any question without presenting any form of identity or any involvement in the community. This allows subjective questions of a more sensitive nature to be asked (and answered) anonymously, creating a shared space more than a community. Because of this, Answerbag questions tended overwhelmingly to be subjective; people

who come to Answerbag are generally not there for objective questions.

Yahoo! Answers straddles a middle ground between these two. To take part in the community, a person must be logged into Yahoo!, though there is no charge to do so. So there is more gatekeeping than Answerbag, but because of the lack of financial investment, less than Metafilter. This, not surprisingly, leads Yahoo! Answers to delivering a broader mix of objective and subjective questions. Though there is, at times, an apparent sense of community in Yahoo! Answers (because people must sign in and thus present some kind of identity) that sense of community is only marginally stronger than it is on Answerbag; there is still the possibility of anonymity, and more focus on the subjective than we see on Metafilter.

Figure 4 shows that in our assessment, over 80% of questions submitted to Metafilter receive answer sets that are likely to fulfill the needs or expectations of the questioner. By contrast, neither Answerbag nor Yahoo! Answers approaches even 40%. At the low end of the spectrum, occasions where MetaFilter users received answer sets that were likely unsatisfactory were vanishingly small, while both Answerbag and Yahoo! Answers had significant numbers of questions (almost 25% for each site) that never received fulfilling answers.
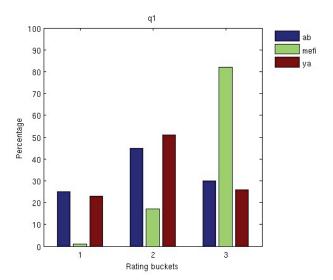

Figure 4. Coding of q1 ("Fulfillment") in buckets by site

Figure 5 demonstrates that, as stated above, archival value does not track perfectly with fulfillment of the questioner's needs or expectations. Yet even acknowledging the recognized possibility of satisfying answers that do *not* have significant archival value, MetaFilter substantially outperforms Answerbag and Yahoo! Answers in the production of answers likely to be valued by others. Almost half of the MetaFilter questions in our dataset received pools of answers likely to be valuable to other Internet users, as opposed to less than 10% of both the Answerbag and Yahoo! Answers questions. Indeed, almost 3/4 of Answerbag's questions, and almost 2/3 of Yahoo! Answers' questions did not generate answer pools of likely archival value. Once again, the number of MetaFilter questions that did *not* generate answer pools of likely archival value was tiny.
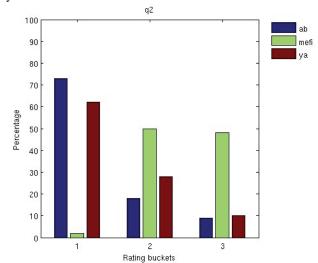

Figure 5. Coding of q2 ("Archivability") in buckets by site

While it is tempting to conclude that because Ask Metafilter more consistently produces the highest likely fulfillment for the questioner, the highest archival value, and (though our assessment is less certain here) the highest level of community-building that it is simply the best of the three sites we have studied. We are **not** making such a claim. While Ask Metafilter's performance in these areas is indeed impressive, it is also important to ask whether and when the community-building that Ask Metafilter enforces serves as a functional limitation on both the range of topics addressed within the site. Indeed, there may be many questions (embarrassing personal or sexual questions are obvious examples) where the levels of community investment at Ask Metafilter would serve as a stifling factor. Of the three sites, Answerbag offers the most functional anonymity. Some of that site's volume might well be attributable to questioners sidestepping the comparatively high demands placed on questioners at the other sites.

Conclusions

This paper presents both quantitative and qualitative analyses of question-answering in online Q&A sites.

The main contribution of this work is a better understanding of the answering that happens in social Q&A sites. This understanding is important because social Q&A is a widely-used mechanism for both information-seeking and question-driven conversational interaction. Millions of questions are posted at these sites, some of them producing

effective responses and others not. Social Q&A has emerged as a professional support tool as well, both among communities of practice (such as StackOverflow for programmers) and as a means of providing support for specific products (such as Intuit's TurboTax Live Community, which is integrated into their tax preparation software products).

We have shown that Q&A sites differ in meaningful ways. Metafilter's gated community was biased towards questions directed at objective information or advice, and it provided more and better answers than the other two sites studied, despite having fewer of the subjective, conversational questions that generally produced the most responses. Prior work by Harper et al. [2008] showed that larger social Q&A sites outperformed smaller ones, but Metafilter is a smaller community than Yahoo! Answers, suggesting that other factors such as commitment and structure may be more important than sheer size.

We also showed that question types matter, presenting a more refined follow-up to Harper et al. [2009] (which compared conversational and informational questions) using a six-way rhetorical taxonomy of question-type that contributed significantly to the ability to predict archival value of answers. Surprisingly, this question-type classification outperformed human coder estimation of potential future archival value of the questions.

While we believe this work is representative of general-purpose social Q&A sites, the generalizability of its conclusions is limited by the data set used. We coded 2600 answers to 300 questions—100 from each of three sites. While random selection assures us that the data is fairly representative of those sites, we cannot generalize these results to differently-structured or specialized Q&A sites (e.g., sites focused exclusively on narrow topics or sites built around Wiki or other shared-editing structures). In addition, with six question categories, not all of which were equally frequent, our conclusions about the less common categories need confirmation in larger data sets.

Our coding mechanism, while effective, also has limitations. We were able to blind the coders to the site and prior classification of questions, but they necessarily had to read the questions and could easily identify question type given their knowledge of the taxonomy. More important, we cannot assess whether the coders have inherent biases about he type of answers that would fulfill asker needs or be archive-worthy; in the future, we hope to supplement such results with user-based studies of actual satisfaction (both of askers and of later seekers). Unfortunately, the available data at the sites was inadequate to perform such confirmation analytically. We were also limited in our ability to analyze community-building in answers due to low agreement between the two coders on that scale. Fur-

ther work is needed to develop and validate a scale for that aspect of Q&A sites.

But taken together, our quantitative and qualitative analyses offer steps forward in the understanding of social Q&A. As research and practice in the area move forward, we hope these findings and insights will help in both the design of sites and the select of analytic tools for research. We are particularly interested in the line of research that combines such analytic tools with machine classification to assist question-askers in posing questions that have a high chance of being answered, and to assist sites in helping distribute the answering opportunities better among site visitors to improve the answering experience and the production of value for questioners and visitors.

Acknowledgments

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