The Incentive Structure in an Online Information Market

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The principal objective of this research was to understand the incentive structure in a mixed economic and social market for information. Prior research suggests that tangible incentives will crowd out intangible incentives; however, information markets invite special examination of this finding. Data representing four years of activity by 523 researchers who gave about 52,000 answers on the Google Answers Web site were collected. Analysis revealed that the main predictor for researchers' participation was the anticipation of tip (gratuity). Analysis of two researcher subgroups showed that in the case of the frequent researchers, the tip was followed by social incentives: interaction (comments) and ratings. For occasional researchers, the tip was followed by the price paid for answers and then by comments. The results suggest that a pure economic incentive serves as enticement; however, social incentives induce persistent participation by researchers and eventually lead to higher average economic gains. The market is catalyzed by social activity, not cannibalized by it, as may have been predicted by theory. This finding provides empirical evidence for "social capital" since social incentives were connected to higher economic gains. The practical implication is that a mixed incentive design is likely to generate lively information-exchange environments.

Introduction

Over the past half century the discussion of information as an economic good underwent an evolution. Fritz Machlup and Marc Porat devised the terms *information society* and *information economy* (Machlup, 1962; Porat, 1977). The information economy concept led to much academic research focusing on information as a good or service to be transferred by market transactions governed by a pricing mechanism. A few years later several researchers acknowledged and discussed peculiarities in the nature of information as an economic good, such as its unusual cost structure, the ambiguity of ownership rights, the feasibility of enforcing intellectual property laws, and so on (Ahituv, 1989; Bates, 1989; Cleveland, 1982; Levitan, 1982). The 1990s saw the rise of the slogan "information wants to be free" together with the rise of the open-source movement and the development and huge growth of the Web, accompanied by visions of a new economy where popularity came before profit (Barlow, 1993; Kelly, 1998; Raymond, 2001; Stallman, 1994). The past few years have seen both a return to more traditional economic thinking (Abramson, 2005; Shapiro & Varian, 1999) and the concurrent development of new, almost utopian, visions of free, socially produced, information (Benkler, 2006).

The evolution of research described above produced literature that seems to be divided into two streams of thought, namely, economic and social. In practice, however, information is concurrently traded as an economic good and given away free for all; therefore, it is associated with a unique tension between purely social and purely economic markets. Are these two markets mutually exclusive? The present article offers an analysis of a mixed social-economic market for information, suggesting that economic markets are catalyzed by social activity. In other words, economic and social activities coexist in a single market and are complementary. Their interplay is suggested as an incentive structure for designing knowledge-sharing systems.

The general questions driving this study are as follows: What is the interplay between social and economic incentives in information markets? Are all market participants motivated by similar incentives? These questions are developed into specific research questions following the development of theory below.

The article starts by defining incentives and describing relevant theory on the tension between economic and social markets, including some related research on knowledge markets, leading to the first research question. Then the particular market that was selected for the present study is described, followed by the description of the distribution of activity in this market, which prompted the second research question. The article continues with an account of the methods and results. Finally, the discussion highlights the significance and applicability of the findings for managers and designers of information-exchange environments.

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Incentives for Information Transactions

Information is its own raw material, meaning that one needs to access and consume information in order to produce information (Benkler, 2006). Information is obtained from resources such as digital and traditional libraries and databases as well as by consultation with people, both peers and experts. The availability of information relies on the willingness of individuals to sell or share their knowledge by formal publishing or by newer forms of computer-mediated communication. Incentives or motivations play a crucial role because they may drive or hinder the willingness to exchange information, and are thus the focus of the present study.

Incentives and motivations are often divided into two major types: extrinsic and intrinsic (Tirole & Benabou, 2003). Extrinsic incentives commonly refer to material rewards for performance, such as payment or other tangible benefits. Such incentives can be agreed upon and certain, as is the case when working for payment. However, monetary incentives can also be uncertain and provided as partial reinforcement. For example, tips (gratuities; voluntary payments beyond the agreed upon payment) are a social norm and are expected for certain workers, such as restaurant waiters or cab drivers (Azar, 2007). As a consequence, a tip can serve as an incentive when it is anticipated according to a social norm.

Generally, in online spaces expectations for tips are not well established, yet people tend to be forward-looking, and anticipate feedback by others (Chen & Gaines, 1998). They quickly adjust their behavior to what they expect and then to what they observe. In the case of information sharing this is known as *observational cooperation*: Seeing that others share will increase both an individual's cooperation in sharing information, and the expectation of further cooperation by others (Cheshire, 2007). Similarly, it is reasonable to expect that contributors of information (answerers) who enter a system and observe that others have received tips may expect to get tips as well; tips may also be given more frequently by users (askers) who see other users giving tips.

The system chosen for the current study displays full information online about payment and tips given in previous information trades. Any newcomer can immediately observe the interactions and incentives provided on the site and is likely to be influenced by observational cooperation.

Overall, for the present research, *tip* is defined as "a socially driven tangible incentive" and has several characteristics: (a) It is entirely voluntary; (b) there is no expectation of an ongoing relationship since participants are anonymous; (c) there are no online tipping norms or traditions developed elsewhere and applied here; (d) giving a tip implies gratitude, i.e., it conveys a social message beyond monetary compensation.

Intrinsic motivation is somewhat complex to define. An early definition describes an individual's desire to perform a task for its own sake: "one is said to be intrinsically motivated to perform an activity when one receives no apparent reward except the activity itself" (Deci, 1971). In other words, accomplishing the task has a gratifying value in itself as it creates a "warm glow" (Andreoni, 1990). Later research expanded the definition, discussing how intrinsic motivation is manifested in various forms of prosocial behavior such as volunteering or charity donations (Meier, 2006). This definition is broader because it includes actions done for the good of other people or for the environment or for some other external recipient, yet it meets the original, classical, definition since there is no apparent reward. This broader definition implies that actions done without tangible or material rewards are based on intrinsic motivations. The rewards for such actions are, for example, enhanced reputation or respect from others and also expansion of social capital. Again, such rewards constitute incentives because of people's tendency to be forward-looking and anticipate feedback. In the system chosen for the present study the intangible incentives include conversation (comments) and ratings.

Similar notions are described by various terms in the academic research literature, probably because incentives received attention from a number of disciplines, mainly psychology and economics. Extrinsic incentives are also known as monetary or economic incentives or rewards. We suggest generalizing these notions under the term *tangible incentives*. Intrinsic incentives refer to the opposite, i.e., nonmonetary, or personal or socially based incentives or motivations. We suggest generalizing these concepts under the term *intangible incentives*. This is not just a semantic issue, since, as explained earlier, intrinsic motivations are quite broad and can include internal, personal, motivations as well as prosocial motivations (which are external). In either case the rewards are not tangible and often they are not immediate or easily apparent. In this article we will use the terms *tangible* and *intangible* to describe the incentives researched here. In describing prior research we will use the original terminology used by the cited authors.

Whereas economic, tangible, incentives are generally accepted as effective, there are cases in which such incentives actually cause a decrease in performance compared with performance based on intrinsic motivations or social norms. For example, researchers have shown that the introduction of monetary incentives reduced the motivation to do volunteer work (Frey & Goette, 1999). This phenomenon is also known as the crowding-out effect (Frey & Oberholzer-Gee, 1997; Meier, 2006), and has been documented in a variety of experiments testing the effect of monetary incentives on prosocial behavior. According to this line of research, effort increases with payment in economic markets. In contrast, effort is independent of compensation in social markets where the reward is intrinsic. Social markets are actually corrupted when monetary incentives are introduced (Heyman & Ariely, 2004).

Given that information can concurrently be traded for a fee and exchanged for free, both tangible and intangible motivations are likely to influence the inclination to participate in information markets. Some questions that arise include the following: Is there a crowding-out effect in information markets or is it possible for both kinds of incentives to coexist? What is the balance between these different incentives? How can this balance be used to promote information exchange?

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Some studies have established a link between motivations or incentives and the willingness to share knowledge. In a theoretical paper Osterloh and Frey (2000) highlight the importance of intrinsic motivations for knowledge sharing within organizations. They explain that extrinsic incentives may only be applied in situations where the outcome sought is explicit knowledge, and that such incentives may crowd out intrinsic motivations for contributing or sharing tacit knowledge. Bock, Zmud, Kim, and Lee (2005) surveyed Korean managers and found that extrinsic rewards exerted a negative effect on individuals' knowledge-sharing attitudes, and that attitudes toward social norms positively affected intentions to share knowledge. These findings are compatible with the crowding-out effect in information markets, although the latter study did not test this effect specifically. On the other hand, Lin (2007) surveyed Taiwanese employees and showed that knowledge-sharing attitudes and intentions were associated both with extrinsic (reciprocal benefits) and intrinsic (knowledge self-efficacy and enjoyment in helping others) motivations. In another line of research, Ling et al. (2005) review social-psychological incentives for participation. They follow in the footsteps of Rafaeli and Larose (1993), who suggested that sharing behavior elicits reciprocity in information sharing, more so than bulletin board policies or management practices. Constant, Kiesler, and Sproull (1994) showed that sharing information products is based on prosocial attitudes, while sharing expertise is motivated by self-expression, again social and personal motivations. Kollock and Smith (1996) analyzed Usenet groups and concluded that social regulation is most efficient for encouraging participation. In other words, the studies cited here suggest that group-related and communication-based inputs can be fed back by the information-sharing system in order to increase contribution, fidelity, commitment, and sense of belonging.

Some of these studies suggest that tangible and intangible motivations may coexist in knowledge-sharing environments without crowding out, while some studies point to the contrary—that the monetary incentives may crowd out intangible motivations to share information, or that the latter motivations are sufficient. The present research aims to investigate this theoretical tension using field research in a real information market. The first research question is, therefore, what is the incentive structure in actual information markets, specifically in online question-answering sites?

We study tangible and intangible incentives concurrently to assess the interplay between them in the market. In order to address this first research question a Web-based hybrid—economic and social—market was selected, namely, Google Answers, which is described in the next section.

Google Answers: A Mixed Information Market

Google Answers (GA) was an online information system established in April 2002 and described by Google as "a way to get help from researchers with expertise in online searching" (http://answers.google.com). The GA service was discontinued by Google as of December 1, 2006. No special reason was given by Google for this move; we speculate that it may relate to the huge success of the free site Yahoo! Answers site, or to Google's greater focus on advertising-related large-scale projects.

Unlike other markets, here the focus was entirely on information. GA combined commercial and voluntary transfer of questions, comments, and answers. GA was a fee-based information market where experts sold their expertise to askers for a price suggested by the askers ($2–$200 per question). Free sharing of information in the form of comments took place alongside the information trades. GA encompassed "researchers" (GARs) who provided responses (or "Answers") to questions that had an associated price (tangible incentive), often accompanied by post-answer tip (gratuity, a socially driven tangible incentive) and rating (intangible incentive). Each answer could be preceded and/or followed by a discussion and comments. Persons who posted questions ("askers"), provided a credit card and a commitment to pay. Designated and certified responders (GARs) were members of a preapproved set, although they, like the askers, remained anonymous and hidden behind pseudonyms. Askers, GARs and the general public could all participate in the discussion free-for-all. A question could be answered by a GAR just once (the asker's bid was for one payable answer, which was then publicly available); however, the flow of free comments was unlimited. This arrangement may imply that questions become increasingly difficult as solutions for prior questions are known; however, there is no objective measure or indication of this being the case. We can only assume that questions are unique because people probably post questions after trying to search for the answers on the Web or within GA before posting a question coupled with a price bid. Following is a description of the system and of the tangible and intangible incentives that are proposed as partial explanation for the GARs' inclination to provide answers in this system.

"Answers" were defined as the responses (for a fee) to specific questions. "Comments" were free advice, opinions, and discussion that appeared on the site, but did not involve a monetary transaction, and did not necessarily involve either a paying customer or an accredited GAR. The rules of the site called for "askers" (buyers) to provide questions accompanied by a predeclared price. Buyers committed themselves to paying this price if and when their question was answered. The GAR who provided the answer received three quarters of the declared price and Google received the rest.

The community in question here was carefully and formally circumscribed. While any owner of a valid credit card could post a question, only preapproved GARs could provide a paid, sanctioned answer. Questions posted to GA were publicly viewable on the Web site. Any registered user could add insights and share the benefit of the research. Answers were also posted publicly. Askers and responders could not move into secluded corners: All transactions involving money, information and feedback occurred in plain sight. Users who provided comments were not paid for their posts, but they could add interesting perspectives to the data gathered by the

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GAR. The identity and personal information of participants were not revealed at any time; all participants were identified only by a self-selected GA "nickname."

Data on the commercial transactions as well as the communication process include prices, questions, answers, comments, time stamps of questions, answers and comments, "star" ratings on a 1–5 scale provided by recipients, and gratuities (tips paid to the GARs). Statistical analyses of these data shed light on some of the interesting theoretical and ideological questions surrounding the value of information.

Three empirical projects and one theoretical research project focused on GA (Edelman, 2004; Rafaeli, Raban, & Ravid, 2007; Regner, 2005; Zhang & Jasimuddin, 2008). The theoretical orientation stressed by Edelman (2004), Regner (2005), and Zhang and Jasimuddin (2008) was the view of information as a private good and to varying degrees the behavior of agents on GA as an instance of labor economics. The guiding question driving the first two studies was an attempt to explain information economics in either labor or behavioral terms. They found that experienced researchers received higher ratings, that answerers adjusted their behavior over time to better suit asker preferences, that the hourly pay for being active on the site as well as tips did positively predict the amount of effort invested (in other words, participation), and that experienced answerers were more specialized. Zhang and Jasimuddin offered an analysis of the pricing strategy of consumers (askers) and of the firm (Google); however, they did not relate this analysis to the perspective of the GARs.

Recent research on incentives in GA showed that when comments provided a satisfying response, no fee-based answer was given, indicating good ethical standards of the GARs. Yet, when comments were used in discussions prior to answers, the GARs were more inclined to provide their expertise in the form of a fee-based answer (Rafaeli et al., 2007). Social activity attracted the GARs, possibly as a form of social approval (Cheshire, 2007). The present study uses a larger data set than these previous studies, collected over a longer period of time from GA, and examines the tangible and intangible incentives in the entire group of GARs.

An intriguing observation that surfaced during the current Google Answers data exploration was that all variables in the system (described in the Measures section below), except *rating*, followed power-law distributions. Figure 1 depicts the power-law distribution of the dependent variable, *number of answers*, per GAR.

Power-law distributions have received considerable research attention especially since the publication of the seminal article by Albert Barabasi and colleagues (Barabasi & Albert, 1999); this phenomenon has been documented for many Web-based activities including file sharing (Adamic, Lukose, Puniyani, & Huberman, 2001), electronic markets (Adamic & Huberman, 2000), electronic mail messages (Ebel, Mielsch, & Bornholdt, 2002), discussion groups (Ravid & Rafaeli, 2004), and response times in computer-mediated communication (Kalman, Ravid, Raban, & Rafaeli, 2006).

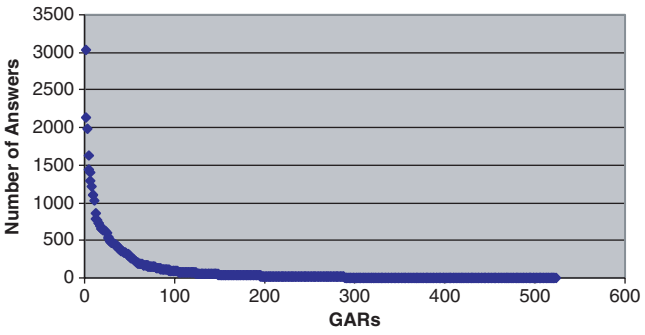

FIG. 1. Power-law distribution of *number of answers* (dependent variable).

Briefly, one of the main implications of this kind of distribution is that patterns of participation vary by orders of magnitude. Some GARs send hundreds of answers while others send very few answers. This significant difference in extent of participation suggests that highly active GARs (we shall call them "frequent GARs") may be motivated differently from the less active GARs ("occasional GARs). The disparity in participation prompted the addition of a new research question to the present study: What are the incentive structures for frequent and occasional GARs?

The Method section describes the research reported here, which is guided by the theory on tangible and intangible incentives, and based on data that spans four years of activity in Google Answers. This study examines the following hypotheses:

H1: Both tangible and intangible incentives will have a positive effect on the number of answers provided by a GAR in the Google Answers Web site.

H2: Tangible and intangible incentives will have different levels of contribution for frequent versus occasional GARs in predicting the number of answers provided.

Method

A specially developed Perl Web agent was used to gather data that represent all the questions, answers, and other content and transactions on the site. The text was parsed and inserted into an SQL database for further analysis. The Web agent tool was designed to produce sequence URLs and fetch them, rather than crawl the site. This method enabled finding unlinked pages, not just the information presented through menus. The result was a large database of questions, answers (for a fee), comments (free), and all technical data available for these items including nickname and ID number of each asker and GAR; exact timing of questions, answers, and comments; price; tip; and rating.

The entire activity of the Google Answers' site (questions, answers, comments, etc.) was collected from its inception in April 2002 through July 2006. Incomplete observations were removed from the beginning and the end of the sampling period to obtain a sample of 129,745 questions covering a period of four years of activity (June 2002–May 2006).

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Measures

Dependent variable.

Number of answers per GAR. Only GARs could provide answers, and they could only provide one answer per question. In addition to analyzing the whole group of GARs, a median split based on number of answers per GAR was used to distinguish between frequent and occasional GARs.

Independent variables.

Price. an extrinsic, tangible incentive. The price is the bid placed by askers per question. For the analysis at the GAR level we used the mean price per GAR, which was the mean price per question answered by a specific GAR.

Tip. a socially driven tangible incentive. Tip is the voluntary gratuity payment offered by some of the askers to the GARs following the submission of a high-quality answer. For the analysis at the GAR level we used the mean tip per GAR, which was the mean tip per answer by a specific GAR. Google Answers was an open system where everyone could see the entire activity of others. For example, a new GAR entering the system could see how other GARs were rewarded and what constituted an answer that yielded a tip. This GAR could then try to adopt similar answering tactics (length of answer, number of links, etc.) to try and provide the quality that resulted in tipping.

GARs who did not receive any tips were assigned a value of zero in this variable.

Rating. a social, intangible, incentive. Askers could provide ratings to answers on a 5-star scale. One star indicated low satisfaction and five stars indicated high satisfaction. The distribution of rating grades deviated significantly from normality but was not a power-law distribution. The reason was that people usually rated when they wished to give a high rating (4–5 stars) and avoided lower ratings (see Table 1 below). Transformation of the *rating* variable was obtained by assigning values of zero and one to nonrated and rated answers respectively. The proportion of ratings per answer per GAR was then calculated. This proportion was normally distributed and used for analysis.

Comments. a social, intangible, incentive. Comments are free conversational messages discussing the question or the answer. Any Google Answers participant (asker, GAR, visitor) could participate in commenting. In order to observe the effect of comments as incentives we used only comments that were given before the submission of a formal answer. In order to avoid a trivial relationship between comments and answers we calculated a ratio between the number of comments before an answer was given and the answer count per GAR. This variable was called *comments-before-answer-per-answer* (CBPA) and was used as an indicator of the activity intensity of commenting activity before answers. For example, if 40 comments were submitted before an expert had submitted a total of 10 answers, this would mean a CBPA ratio of 4.

Analysis

Since the research questions and hypotheses are about motivations of GARs to participate, the data was aggregated and analyzed at the GAR level. Inferential statistics were performed on summary data of the entire set of questions answered at the GAR level.

The raw data with the power-law distribution did not conform to the basic assumption of a linear regression analysis, which is that the independent and the dependent variables have a linear relationship. In order to perform regression analysis, the data were logarithmically transformed following Raban and Rabin (2008). Since a log of zero is not possible, we added a small positive value to variables that included zero values. Descriptive statistics were calculated for the raw, untransformed data. Hierarchical regression was performed taking in *price* in the first block of the regression and the other three independent variables in the second block in a stepwise procedure. The reason for this is that price is coupled to the questions when they first appear online and thus is the first incentive that is clearly visible to GARs when they enter the system. Comments, rating, and tip appear during and after participation. The separation into two blocks and then the stepwise procedure within the second block prevent multicollinearity.

The structural equations modeling (SEM) methodology was applied in order to build a model that would provide an overview of the relationships among all the variables, and confirm and further develop the findings that emerged from the regression analysis. The effects of the incentives on the extent of GAR participation were estimated using the maximum likelihood method with AMOS 6. The measurement model explored the relationships between three exogenous variables (i.e., *price*, *comments*, and *rating*) and two endogenous variables (i.e., *tip* and *number of answers*) for each of the two subgroups (occasional and frequent GARs). The model was based on the transformed variables. Two competing models were tested: one with the entire group of GARs as a whole, and the other based on the division into subgroups of frequent and occasional GARs.

Results

Table 1 provides descriptive statistics comparing the present study with earlier studies by Edelman (2004), Regner (2005), and Rafaeli et al. (2007).

Of the 129,745 questions in the dataset, about 40% were answered. Those answers were associated with conversation in the form of comments; 62,504 comments were contributed to the answered questions.

Table 2 presents the mean values for all independent variables in this study for the entire group of GARs and for each subgroup.

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TABLE 1. Descriptive statistics in Edelman (2004), Regner (2005), Rafaeli et al. (2007), and in the present study.

GA element	Edelman (2004)	Regner (2005)	Rafaeli et al. (2007)	Current Study
Period of study	04/2002–11/2003	07/2003–01/2004	06/2002–10/2004	06/2002–05/2006
Duration	20 months	7 months	29 months	48 months
No. of questions asked	43,262	13,948	77,673	129,745
No. of questions with comments only	NA*	NA	21,828	50,831
No. of questions with comments	NA	NA	39,436	69,720
No. of comments sent	NA	NA	97,802	180,705
No. of answers provided	24,290	6,853	37,970	52,006
Rated answers	NA	NA	23,868	32,854
Tipped answers	NA	1,745	7,503	10,959
No. of experts	534	NA	512	524
Average dollar value of question	NA	$19.23	$19.37	$20.90
Average dollar value of answer	$18.91	$21.59	$20.10	$22.51
Average dollar value of unanswered question	NA	NA	$18.66	$19.81
Average answer rating (on a 5 point scale)	4.33	4.70	4.60	4.63
Average answer tip value	$8.77	$8.94	$8.86	$9.09
System price range	$2–200			
System tip range	$1–100			

*NA: Data not available in the article.

TABLE 2. Means for all independent variables in the entire group of GARs and in the subgroups of frequent and occasional GARs.

	Price	Tip	CBPA	Rating
Entire group	$17.32	$4.94	1.77	4.35
Frequent GARs	$20.96	$8.04	2.00	4.50
Occasional GARs	$13.72	$1.88	1.54	4.15

Pearson's coefficients and regression models (block and then stepwise) were calculated following logarithmic transformations of variables that had power-law distributions. This was done in order to predict the GARs' tendency to provide answers by four independent variables: *price*, *comments*, *tip*, and *rating*. The analyses were performed for the entire group of GARs ($N = 523$) and for the two subgroups created by a median split: frequent and occasional GARs. The findings are summarized in Tables 3 and 4 and explained below.

Entire Group of GARs ($N = 523$)

The highest correlation with the dependent variable, *number of answers per GAR*, was with the *tip* variable, followed by *price*, *comments*, and *rating*, as shown in Table 3.

The hierarchical (Block 1 = Log *price*, Block 2 = Log *tip*, Log *CBPA*, Rating proportion) regression model was statistically significant ($F_{3,519} = 180.68$, $p < .001$) with an adjusted $R^2 = .508$. The predictor variables are shown in Table 4.

The Beta values indicate the unique contribution of each independent variable to the prediction model of incentives for GARs to provide answers. While *rating* had a statistically significant positive correlation with the number of answers, it did not have a significant contribution to the regression model at the <.05 level after the other variables had entered the model.

Frequent GARs ($N = 260$)

According to Table 3 the highest correlation with the dependent variable, *number of answers per GAR*, was with the *tip* variable, followed by *price*, *comments*, and *rating*.

The regression model for frequent GARs was statistically significant ($F_{4,255} = 12.35$, $p < .001$) with an adjusted $R^2 = .149$. The predictor variables are shown in Table 4. The overall explained variance was 14.9%, which is much lower than the finding for the entire group, the possible reason being range restriction: only half the GARs were included in the "frequent" group, and so the *number of answers* (the dependent variable) was restricted in this analysis. The range of *number of answers* for the entire group was (on a logarithmic scale): 0–3.48. By analyzing only the frequent GARs the range was restricted to 1.11–3.48.

Rating had a positive and statistically significant correlation with the number of answers and contributed 1.1% to the explained variance after *tip* and *comments* entered the model in the stepwise procedure. Interestingly, although Log *price* was the first block to enter the regression model it did not have a statistically significant contribution to the model. In the case of frequent GARs, the predictors of the number of answers were tip, comments, and rating, in that order (Table 4),

Occasional GARs ($N = 263$)

According to Table 3, the highest correlation with the dependent variable, *number of answers per GAR*, was with the *tip* variable, followed by *price* and *comments*. *Rating* was not a statistically significant predictor of participation by the less-frequent contributors.

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TABLE 3. Pearson's correlation values for the relations between incentives and level of participation by the entire group of GARs and for each of the subgroups (Frequent GARs $N = 260$; Occasional GARs $N = 263$).

	Entire group of GARs					Frequent GARs					Occasional GARs				
	Log number of answers	Log price	Log tip	Log CBPA	Rating proportion	Log number of answers	Log price	Log tip	Log CBPA	Rating proportion	Log number of answers	Log price	Log tip	Log CBPA	Rating proportion
Log number of answers	1.00	.42**	.68**	.37**	.14**	1.00	.22**	.36**	.18**	.16**	1.00	.28**	.37**	.26**	.11
Log price		1.00	.46**	.13**	.08*		1.00	.53**	.03	−.12*		1.00	.17**	.02	.09
Log tip			1.00	.31**	.22**			1.00	.14*	.17**			1.00	.15*	.23**
Log *CBPA*				1.00	.07*				1.00	<.01				1.00	.05
Rating proportion					1.00					1.00					1.00

$^*p < .05$. $^{**}p < .001$.

The regression model for occasional GARs was statistically significant ($F_{3,259} = 25.85$, $p < .001$) with an adjusted $R^2 = .221$. The predictor variables are shown in Table 4. The overall explained variance was 22.1%, which is much lower than the finding for the entire group, again the reason being range restriction (0–1.11).

Tables 3 and 4 reveal that the motivations for the GARs who contributed less than the median value of answers were similar to the motivations identified for the entire group.

Model Development

Of the two competing structural equations models, better fit parameters were obtained for the model based on the two subgroups. The measurement model described the influence of incentives on the tendency to provide answers by GARs in each of the two subgroups, occasional and frequent ($\chi^2 = 6.934$, NFI = .973, CFI = .996, RMSEA = .017). The model fit parameters were very good (NFI and CFI both >.95, RMSEA < .05) and superior to a model of the complete group of GARs without the division to subgroups. The model is depicted in Figure 2, showing that price has a direct effect on the number of answers only for the occasional GARs and rating has a direct effect only for the frequent GARs. The beta values are indicated alongside each arrow. The explained variance of the tip and the number of answers is shown in Figure 2.

Discussion

The current study sought to explore the antecedents for contribution of information in a hybrid economic and social information market that takes place via an online system. While the general intuition would be to say that money matters, i.e., that GARs will be motivated mainly by the price per question offered by the asker, the results reveal a rich mosaic of motivations offering empirical support for the notion that social capital leads to material benefits. For example, comments (intangible, social incentive) predicted both a higher rate of answer provision, which constitutes economic activity, and higher tips, which, in turn, also predict the tendency to answer.

The purpose of this study was twofold: to shed light on the interplay between free and fee-based activity and to distinguish between two different subgroups of actors in the market, frequent and occasional GARs. The results confirm both hypotheses driving this study.

As predicted by Hypothesis 1, the overall incentive structure in the GA information market consists of a mixture of pure tangible incentives (price), socially driven tangible incentives (tip), and intangible incentives (comments and rating).

While both subgroups are motivated mainly by the *tip* variable, as is the whole group, the motivations of the two subgroups differ, as predicted by Hypothesis 2. Occasional participants are driven more strongly by tangible incentives, whereas intangible incentives are more pronounced in the

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TABLE 4. Beta values (Block 1 = Log *price*) for the predictors of participation by the entire group of GARs ($N = 523$) and for each of the subgroups (Frequent GARs: $N = 260$; Occasional GARs: $N = 263$).

	Entire group of GARs			Frequent GARs			Occasional GARs		
Variable	Beta	*p*	Cumulative Adjusted R^2	Beta	*p*	Cumulative Adjusted R^2	Beta	*p*	Cumulative Adjusted R^2
Log price	.135	<.001	.174		ns		.220	<.001	.073
Log tip	.566	<.001	.479	.279	<.001	.125	.304	<.001	.180
Log CBPA	.180	<.001	.508	.135	<.05	.138	.213	<.001	.221
Rating		ns		.126	<.05	.149		ns	

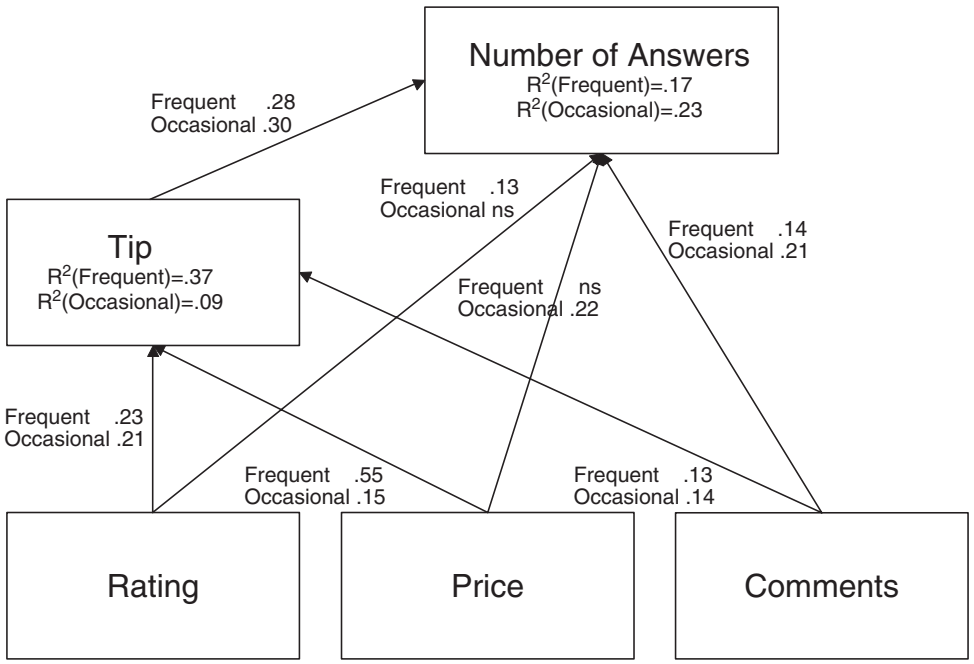

FIG. 2. Incentives for participation by frequent and occasional GARs.

subgroup of frequent contributors. A discussion of the entire set of incentives influencing the whole GAR population as well as the two subgroups follows.

Entire Group of GARs

The descriptive statistics in Table 1 describe a vibrant information market. Comparing the 29-month study (Rafaeli et al., 2007) with the current study we see an increase in the mean values of all four incentives.

Analysis of the entire group of GARs shows that the main predictor of the GARs' inclination to provide fee-based answers is the socially driven tangible incentive, the tip. While a tip was offered to only 306 out of 523 GARs, it is still a very strong predictor. This result is especially striking since in the regression *price* was entered prior to *tip*, yet *tip* contributed most to the explained variance. A tip is given after an answer is provided, so how does it predict the provision of answers? We have already alluded to this in the Theory and Measures sections above. The short answer is that the system is very large and active, so any given incoming expert already sees the existing tipping activity and then tries to provide answers of comparable quality that are likely to result in a tip. In this sense tip is similar to rating: both incentives are socially based and reflect people's tendency to be forward-looking and anticipate feedback (Chen & Gaines, 1998; Cheshire, 2007).

A tip constitutes partial reinforcement: Obtaining it is not guaranteed and requires patience, but persistence is rewarded as evidenced by mean *tip* in Table 2. It is suggested that tipping be investigated in additional Web markets in order to evaluate its relation to other incentives. Future research may also compare tips with other forms of voluntary payments, such as payment for shareware. Tips are also interesting because they are a post hoc form of payment and have the

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potential to reduce the inspection paradox (Van Alstyne, 1999) and to aid in developing theory for more efficient markets for experience goods (Nelson, 1970; Shapiro & Varian, 1999).

Price contributed 17.4% to the total explained variance when it was entered first to the hierarchical model, while *tip* contributed 30.5%. This result is quite counterintuitive. The basic intuition is that the pure tangible incentive, price, which is very salient as part of the system design, would be the strongest predictor for activity. In fact, its role is substantially smaller than that of the socially driven tangible incentive, the voluntary payment of tips. The model generated by the SEM analysis for the whole group divided into two subgroups (Figure 2) suggests that price influences tip, which, in turn, induces the GARs to provide answers. For the occasional GARs, price had a direct effect on number of answers in addition to the indirect effect through tip. Overall, it is safe to say that the effect of price was always mediated by tip and in some cases it had direct influence.

The modest direct contribution of price is in contrast to the work of Heyman and Ariely (2004), who showed that economic and social incentives cannot coexist, a phenomenon also known as the crowding-out effect (Frey & Oberholzer-Gee, 1997). Since this is a field study, it was not possible to test whether participation patterns change upon the introduction of one of the incentives when others were already present. This research does, however, show that a market can function and thrive over a long period with intangible and tangible incentives coexisting. Descriptive statistics reported previously (Rafaeli, Raban, & Ravid, 2005) show that over the years covered in this study the average monthly social and economic activity increased.

Information is an unusual market good characterized by several paradoxes relating to its value (Raban, 2007). The coexistence of tangible and intangible incentives without crowding out may be yet another unique feature of information markets compared to other market goods. If this is the case, then this study can be viewed as an extension of Heyman and Ariely (2004).

The current results are also different than the findings of Bock et al. (2005), who found that extrinsic economic rewards may hinder knowledge sharing, while social incentives serve as promoters. The difference may stem from a number of reasons that highlight the importance of system design and of context: (a) GA is a Web-based platform, not an organizational system. In organizations, people receive salaries, so the tangible incentives for knowledge sharing may seem inappropriate or small in relation to the salaries. (b) In GA monetary rewards are offered directly by the customer, not predetermined by the supplier. (c) The methodology employed in the present study is different than that in Bock et al.

As indicated earlier, initial data exploration showed that the distribution of activity and incentives on GA followed a power-law curve (Figure 1). The power-law distribution of participation suggests that there are large differences in participation among GARs. Some GARs contribute frequently, some only occasionally. An analysis of these two subgroups yields surprising results: Frequent contributors are motivated more by intangible incentives than occasional contributors, who are motivated more by tangible incentives.

Frequent GARs

Table 2 shows that on average frequent GARs received substantially higher rewards for participation than occasional GARs, which implies that there is a learning curve for providing answers to more expensive questions and receiving higher tips and ratings. Persistence accompanied by learning pays off economically as well as socially. Statistical analysis helps discern what makes some GARs more persistent and motivates them to become frequent contributors to the GA system.

Table 3 shows a substantial reduction in the correlations of *number of answers* with *price*, *tip*, and *comments* compared with the finding for the entire group. At the same time we see a slight increase in the correlation with *rating*. Table 4 shows that the explained variance is predicted by *tip*, *comments*, and *rating*. Generally speaking, frequent contributors of answers are more motivated by socially driven incentives than the entire population of GARs. Comments and rating are forms of information exchange that may serve to reduce uncertainty, thereby increasing the rate of commerce, similar to the effect obtained in eBay (Flanagin, 2007).

Surprisingly, *price* was not a statistically significant predictor for frequent GARs' tendency to provide answers even though it was entered into the first block of the regression model. Figure 2 sheds light on this unexpected outcome.

The measurement model (one model including both subgroups) in Figure 2 confirms that frequent GARs are more influenced by socially based incentives. Both intangible incentives, comments and rating, had a direct influence on the number of answers, and an influence mediated by the socially constructed tangible incentive, tip. *Price* had only mediated influence via tip, and no direct effect on the number of answers. This is interesting especially in light of the data in Table 2, which informs us that the frequent GARs, on average, opted to answer higher-priced questions. It may seem natural that higher prices induce higher tips assuming that, similar to tipping for other services, an acceptable rate emerges (Azar, 2007). Looking at the mean values of *tip* and *price* we see that tip amounted to about 38% of the price in the case of the frequent GARs, whereas it was under 14% for the occasional GARs. The differing tipping proportions can be viewed as an indicator of the high quality of answers provided by the frequent GARs. Their increased effort was recognized and generously rewarded by the askers. This may be the equivalent or monetary expression of reputation; a recent study on eBay revealed that high seller reputation leads to higher bid prices (Flanagin, 2007).

The contribution of *comments* to the explained variance was both direct and mediated through *tip* as seen in Figure 2. Merely observing that comments were posted for a question increased the likelihood of an answer and also generated higher tips. This provides support and an extension to the

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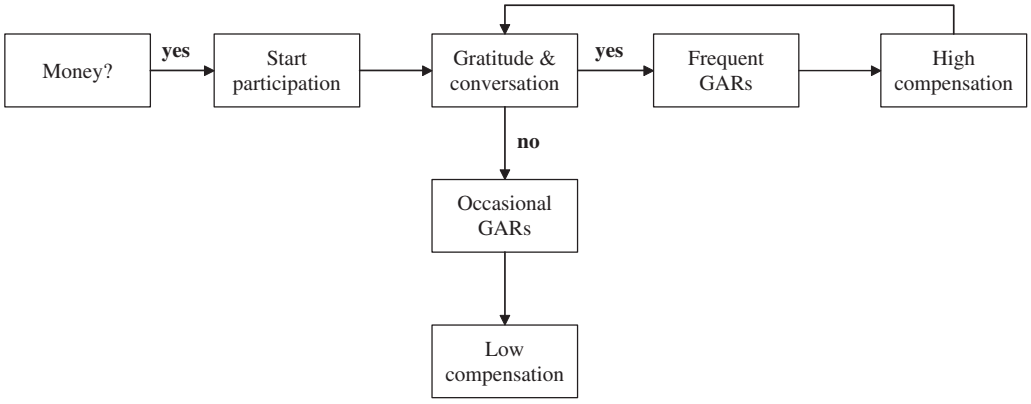

FIG. 3. A schematic representation of entrance, participation, persistence, and cessation of activity by GARs in the GA system.

theory of observational cooperation cited earlier (Cheshire, 2007). According to the theory, cooperation leads to more cooperation. The present findings indicate that cooperation leads to more paid service (GAR answers) and to higher monetary compensation (tip).

While the statistical analysis suggests that *tip* is the main predictor of participation, there may be other factors involved that cannot be quantified and modeled in the present study. For example, it is conceivable that the frequent GARs have a strong personal interest in answering questions and just enjoy doing it. Again, there is no data to indicate this directly; however, anecdotal evidence from following the written reactions of several GARs when Google announced the discontinuation of the GA service suggests that personal gratification and a sense of belonging to a community were strong motivators for the prominent GARs[1,2,3].

Occasional GARs

Tables 3 and 4 indicate that in the occasional GARs subgroup, tip is still the leading incentive for participation, followed by price and comments. Rating was not a statistically significant incentive for occasional GARs. Of the answers given by occasional GARs, 57.7% received ratings, so that lack of statistical significance cannot be attributed to a low rating activity. Occasional GARs are more motivated by monetary incentives compared with the frequent GARs.

The measurement model in Figure 2 provides further support for the claim that occasional GARs are more motivated by tangible incentives. Price had a direct influence on the number of answers and an influence mediated by tip. Rating had only mediated influence on this group of GARs and no direct effect on the number of answers. Comments had both direct and indirect influence. Overall, tangible incentives are more pronounced in the case of the less-frequent providers of answers, the occasional GARs.

[1]https://answers.google.com/answers/threadview?id=787060
[2]https://answers.google.com/answers/threadview?id=787063
[3]https://answers.google.com/answers/threadview?id=787065

Study Limitations

Although the findings presented here offer a new look at incentives for participating in information markets, it has several limitations. First, this study analyzed one market. It is conceivable that other markets may reveal a different composition of incentives. In addition, the results obtained here by exploratory field data analysis need to be corroborated by controlled experiments. For example, experiments could be used to deepen our understanding of voluntary payments and their usefulness as a business model for online information. Controlling the tangible and intangible incentives could help to better understand the interplay between these two types of incentives and explore the limits of their efficacy. Another limitation is that the findings are limited to Web-based open markets; further research is needed if the results are to inform organizational contexts more specifically.

Summary and Conclusion

While money definitely matters and constitutes an important motivator for participation, it is not exclusive, nor is it always the most dominant motivator. Granted, tip is a form of payment, but it is socially constructed and demonstrates gratitude (a synonym for *tip* is *gratuity*; Azar, 2007). So it is safe to say that GARs are generally motivated mainly by gratitude. Beyond that, occasional GARs are also motivated by money (price) and conversation (CBPA), whereas frequent GARs are more motivated by conversation and intangible gratitude in the form of rating.

This research shows the importance of social gratification for persistence in an information-exchange system over time as evidenced by the frequent GARs. Money is certainly an enticement, but for long-term economic relationships, "softer" incentives are essential. This study provides empirical support for the notion of economic rewards for persistence, as frequent GARs received higher mean prices and tips. While the analysis presented here does not necessarily imply causality, it is reasonable to describe the relationships between the examined constructs as suggested in Figure 3.

Figure 3 shows a direct link between social gratification and economic payoff, meaning that social activity is not

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a waste of time even in an economic system. To the contrary, social gratification ensures the system's longevity and dynamism, which, in turn, feed back into economic activity and outcomes. Hence tangible incentives are important but not sufficient. Further, the term *social capital* here assumes its literal meaning: Social activity catalyzes economic activity and outcomes.

Finally, this study examined a public system serving as an international information-sharing market; however, insights from this market may be applied and further investigated in organizational knowledge-sharing systems. Social influences are likely to have a substantial effect in organizational settings, and should not be overlooked when making formal plans for information systems or assessing their success. Partial reinforcement using tangible incentives coupled with social interaction and other intangible incentives is likely to generate lively information-exchange environments.

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