Importance of Mutual Benefits in Online Knowledge Sharing Communities

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Abstract:

The sustainability of knowledge sharing e-communities is a major issue at present. A hypothesis was proposed at the outset in the paper that the provision of mutual benefits among participants will lead to positive participation. Drawing from the economic and social theories, a framework for analysis was developed and tested in an empirical study. The preliminary results demonstrated a direct relationship between mutual benefits and the level of participation, and hence supported the hypothesis.

Keywords:

Knowledge sharing, mutual benefits, e-communities, virtual knowledge sharing environment

1 Introduction

Advances in information and communication technologies (ICT) have greatly heightened the interests in online knowledge sharing (Swan, Newell et al. 2000). Various forms of e-communities for knowledge sharing have emerged for active dialogues among participants in order to facilitate knowledge sharing in a flexible way (Wenger 1998; Davies 2001). However, many of the technical solutions for knowledge sharing communities have suffered from the lack of active participation and efforts have been made to address the human factors and/or the functionalities provided within these online environments (Snowdon and Grasso 2001; Brazelton and Gorry 2003).

This paper presents a new angle for the analysis of the sustainability issue in online knowledge sharing communities. Economic principles have been employed in this study to analyse the characteristics of knowledge sharing in an e-community 'market' along with participants' motivation and expectation. A hypothesis is proposed as an underlying force driving sustainable online knowledge sharing communities. It suggests that mutual benefits have a positive effect on participants' activity in online knowledge sharing. To test this hypothesis, an empirical study was conducted using the participants in an in-house virtual knowledge sharing environment. The results from the analysis should provide insights to designers and champions of future online knowledge sharing communities.

2 Framework for Analysis

To investigate the dynamics of a knowledge sharing community, comparisons are drawn between knowledge exchanges and exchanges of 'commodities' in an economic market. Together with participant's motivation and expectation, these form the variables to be analysed in the empirical study.

2.1 Characteristics of an e-Community Knowledge Market

If 'knowledge resources' could be treated as a commodity, it would be helpful to examine the ingredients of a sustainable economic market and extrapolate. These are: (i) supply and demand supported by a pricing system, (ii) reliable interaction surrounding the exchange of 'product' and (iii) the notion of the cost and benefit (Sloman 2003).

During the process of knowledge sharing, knowledge resources are given by one party (supply) and received by another (demand), and an exchange occurs via the

network in a community (market). The idea of trading knowledge in the market has recently emerged, and the characteristics of knowledge assets and the pricing system have been also preliminarily investigated (Muller, Spiliopoulou et al. 2002).

However, unlike an economic market, in an e-community knowledge market there is no agreed method of quality or quantity evaluation of a 'knowledge resource' (compared to a 'product') and hence difficult to establish a sensible pricing system related to supply and demand. The notion of cost and benefit (or gain) may also be vague, and worth further investigation.

2.2 Cost and Gain

According to the law of supply and demand in the economic market (Sloman 2003), the pricing system influences the behavior of suppliers and buyers, and vice versa. As there is no usable pricing system in the e-community knowledge market, an alternative 'regulation' of participants' behaviour would be the benefits based on each individual participant's assessment on the balance of cost and gain at a given time and/or accumulatively over a period.

The cost and gain in a knowledge exchange can be the 'value' of the knowledge resources contributed or received. However, different from the economic market, it is not obvious how to value a piece of knowledge. Moreover, the cost to the knowledge supplier is paid immediately without any guarantee of a returned gain. Even when there is a potential gain, it might take a while to develop by appropriate 'value-added' actions (Cabrera and Cabrera 2002).

The empirical study will attempt to articulate the participants' perceived cost and gain in an e-community knowledge market.

2.3 Motivation and Expectation

Motivation for participating in a knowledge sharing community is well rehearsed in computing literature. The common ones, which are focussing on the 'sharing' aspect, include the ability to tap into expert knowledge held somewhere else, connecting people who are located in different places, or the accumulation of knowledge resources which can also serve as an organisational memory (Goodman and Darr 1998; Dickinson 2002). There are other motivations based on the benefits from

individual productivity tools that come with the 'sharing environment' (e.g. the use of the environment for accessing personal email from anywhere in the world).

In addition, participants' motivation and behaviour in knowledge sharing may also be affected by economic and non-economic factors (Wasko and Faraj 2000). Based on the social exchange theory (Kelley and Thibaut 1978), participants' motivation and activities reflect their expectation on the benefits from their participation in terms of costs and gains (Constant, Kiesler et al. 1994; Jarvenpaa and Staples 2000; West and Turner 2001). This may cause some problems in sustainable knowledge sharing within an online community as explained below.

The first problem is known as a 'public good dilemma'. An online knowledge sharing environment can sometimes be treated as a shared resource similar to a 'public good' (e.g. a public park) from which each participant may benefit, regardless of whether he/she contributes to its provision (Olson 1965). Since access to a public good is not restricted to its contributors only, there is a temptation for individuals to adopt a 'free-ride' strategy: to enjoy the resource without contributing to it (Sweeney 1973). This 'free-ride' strategy is considered to be a dominant strategy (Dawes 1980) that yields immediate positive return at any time during the interaction, regardless of which actions other participants may take. The current use of the World-Wide Web is a good example. However, if the majority of the participants based their expectation on the 'free-ride' strategy, a 'deficient equilibrium' will reach at some point as a 'social fence' that prevents all participants from collaboration (Messick and Brewer 1983). In the special case of a 'closed' knowledge sharing community, this equilibrium point might be reached quicker.

Knowledge sharing may also be conceptualised as a special example of a 'social dilemma' (Connolly and Thorn 1990). In this case, individuals' rational actions for maximizing their pay-off lead to collective irrationality (Kollock 1998). In a knowledge sharing community, the situation at an aggregate level can result in preventing the individuals to cooperate and share their own knowledge resources with others as every participant expect to maximise their pay-off (Cabrera and Cabrera 2002).

The above dilemmas may have provided some insight into the contributing factors for the difficulties experienced in some online knowledge sharing environments. In the empirical study, an attempt will be made to find out the participants' motivation

and expectation. The data will be analysed to establish their relationship with the members' level of participation.

2.4 Hypothesis

The economic and social theories indicate that there should be a correlation between individual's 'cost and gain' and the knowledge sharing activities in the online environment. In other words, if every individual's 'expected gain' can outweigh 'expected cost', the e-community knowledge market should be sustainable. Hence this study aimed to test the following hypothesis:

"Mutual benefits have a positive effect on participation and contribution in knowledge sharing e-communities." In this context, mutual benefits exist when there is a feeling amongst the critical mass of participants that their overall gain exceeds the cost, and each participant take on the role of a supplier and a user of knowledge.

To 'measure' the amount of mutual benefit, a concept of 'beneficial factor' is introduced and its application will be shown in section 4.5.

3 Methodology for the Empirical Study

3.1 Sample size

To test the hypothesis, an empirical study was designed to investigate into the relationship of participants' expectations, cost/gain and their participation in an in-house virtual knowledge sharing environment (KSE). There were over 1500 registered users in approximately 200 groups in this KSE over a period of 3 years, with approximately 200 active users at the time of study. Its main functionalities included contact books, expertise matcher, search, document sharing and management tools, email, discussion and desktop conferencing. 17 of the KSE members were chosen as informants for the study, who had played different roles in their groups/communities within the KSE (e.g. leader, expert, administrative manager or group member).

3.2 Methods

The empirical study was conducted via a survey that consisted of a questionnaire and semi-structured interviews. It was designed in accordance with the principle of combined methodology for survey studies (Babbie 1990). The instruments of the survey were developed based on relevant literature and the results of prior interviews and

discussions with the KSE support team members. It was pilot-tested with the KSE support team.

The questionnaire was used as the basis of the semi-structured interviews, during which new emerged issues could be followed-up. The questionnaire included four sections: [i] informants' participation in online knowledge sharing via the KSE; [ii] their expectation on the cost and gain; [iii] their assessment of current costs and gains as knowledge suppliers and users in online knowledge sharing; and [iv] related activities of knowledge sharing outside the KSE. There were 5 to10 questions in each section and the variables of cost, gain and participation were measured on a scale of 1 to 5, with 0 for not applicable. An overview of the main 'units of analysis' in the survey is listed in the Appendix.

The narrative data taped from the interviews were analysed using content analysis (Krippendorff 1980) to develop categories describing [i] participators' motivation for online knowledge sharing, [ii] their considerations for the costs and gains in online knowledge sharing as knowledge suppliers and users, and [iii] their expectations on the costs and gains and their participation.

All statistic work was carried out using Sigma Stat (SPSS).

4 Results

Data collected from the survey were analysed under five headings. They are: [i] informants' motivations for participation in knowledge sharing with the KSE; [ii] informants' perceived costs in knowledge sharing; [iii] perceived gains; [iv] informants' expectations on the balance between costs and gains and if these had influenced their participation; and [v] the relationship between participation and mutual benefits.

4.1 Motivations

The main motivations are listed in Table 1 below.

No.	*Motivations and % of informants*	*Sample comments*
I	Geographically distributed knowledge sharing and 88% of the informants gave this as motivation.	"One of the investigators in our project is an off campus contact; the KSE provides us a place to access to the project documents and resources."
	Knowledge transfer from	"the KSE is mainly used for sharing

II	academia to industry or practice (50%)	knowledge between the practitioners and policy makers in local Council and the researchers in two universities. The academic researches hopefully can improve policy making for the practitioners."
III	Multi-disciplinary knowledge sharing (35%)	"the KSE provides a place for the researchers in the art faculty to meet those in engineering and science."
IV	Miscellaneous (12%)	"I used it (the KSE) to manage my personal documents."

Table 1: Informants' motivations for knowledge sharing in the KSE

4.2 Perceived Costs

According to informants' view on the noticeable costs, the main costs are listed in Table 2. Cost I was indicated by all informants. Most of them reported that the high pressure of their research work did not allow them to make more contributions in the KSE. Cost II was high during the early stage of their participation in order to get familiar with the KSE. Cost III was reported by the informants as significant in terms of privacy, permissions, and ownership of the knowledge resources they provided, as well as the high competition for funding and publications in academic research.

No.	*Costs and % of informants*	*Sample comments*
I	Cost of efforts/time in knowledge sharing interactions: 100% of informants had considered the cost.	"[For the efforts put into commenting on shared resources], in terms of the effort to use the KSE to upload my comments, the efforts are low, but the efforts to make those comments are very high."
II	Cost of efforts/time to learn to use the technologies (70%)	"I found the cost at that time was very high… as learning how to use the system takes some efforts…"
III	Cost of knowledge resources (52%)	"The group permission setting in the KSE is very "flat"… I need more hierarchical settings to share some data…"

IV	Miscellaneous (18%)	"I also provided support on using the KSE in our group."

Table 2: Costs in knowledge sharing in the KSE

4.3 Perceived Gains

The main gains reported by the informants' are listed in Table 3. Gain I was valuable to all informants who were looking for solutions to their research problems and /or generation of new knowledge. Gain II was reported in terms of social recognition and influence in the e-communities. Gain III was the organizational benefits and was always tangible, for example, publication or acceptance of funding applications.

No	*Gains and % of informants*	*Sample comments*
I	Gain of knowledge resources obtained by 100% of informants	"The most significant gain for me is definitely the documents and support I got from others."
II	Social gains were considered by 47% of informants	"…some gains for me are outside the KSE and beyond the knowledge exchange. It is the recognition within our community, both in the virtual and the physical world…"
III	Positive organizational outcomes (30%)	"[the gain] is that our project can get off the ground…"
IV	Miscellaneous (12%)	"…the avoidance of large documents in email flows."

Table 3: Gains from knowledge sharing in the KSE

4.4 Expectations on the costs and gains

In general, all informants expected at least a balance of costs and gains. The balance could be either in short term or in long term, which was associated with informants' roles in their groups/communities. Informants' expectations on costs and gains during three periods of their participation are listed in Table 4.

	Initiation (Period I)	*Interaction (Period II)*	*Harvest (Period III)*
Costs	Cost II	Cost I, Cost III	Cost I & III
Gains	Gain I	Gain I, Gain II	Gain III
Group members' expectation.	Cost II > Gain I; High Cost II acceptable, considerations for the quality of Gain I.	Cost III <= Gain I; Gain I positive to participation; Gain II (expertise recognition) positive to participation; Cost I negative to contribution; Cost I was judged within the community context.	Not applicable
Group leaders' expectation	Cost II > Gain I; High Cost II acceptable, Gain I not considered.	Cost III >= Gain I; Gain I positive to participation; Considerations for the security of 'sensitive' information for Cost I; Gain II (social network and status) positive to participation; Cost I and III were judged from a community perspective.	Cost I + Cost III < Gain III

Table 4: Expectations on costs and gains

At the beginning of the informants' participation (during the Period I), most of them could accept high costs of time and effort (the Cost II) to learn the technologies, since the cost was treated as an investment. However, some informants might give up if the costs went beyond their limits. The length of this period varied depending on informants' IT experience.

During the Period II, the informants' considerations for the costs and gains were knowledge-oriented as well as community-oriented. Out of all the informants, 35% of them reported that they would participate actively only if the Gain is high and can cover the Cost. 30% of the informants' participation and contribution could be affected by the costs of time and effort (Cost I) due to high pressure of work. 47% of the informants realized that the social gains (Gain II) had improved their sense of community and recognition in their groups/communities, which could encourage their participation. In

terms of exchange of knowledge, there was a difference between difference groups of informants. Most ordinary group members (63%) expected at least a balance between their contributing and receiving knowledge. Most group leaders (about 80%) could accept contributing more than receiving resources.

During Period III, tangible gains (Gain III) were expected mainly by the informants who were research administrators and group leaders. Their expectations of the balance between costs and gains were low in the Period I and II. However, their expectations of gains (Gain III) increased remarkably during this period. In other words, they looked for a balance of their costs and gains in long-term participation. It has been also found in the study that an extended achievement of the organizational outcome gains could significantly affect their decision on continuing participation in the online knowledge sharing.

4.5 Relationship between participation and mutual benefits

Figure 1 shows the relationship among cost, gain, mutual benefits and activity of informants' participation. The data of costs and gains collected from the questionnaire were taken only in terms of exchange of knowledge resources (Cost I and III and Gain I and III). The activity of participation was estimated based on the data from the questionnaire and the KSE log file. The data of each informant's total costs, gains and his/her activity in a range of 0 ~ 5 were normalized, and were fitted with a linear regression and an exponential function, in Figure 1A and 1B, respectively.

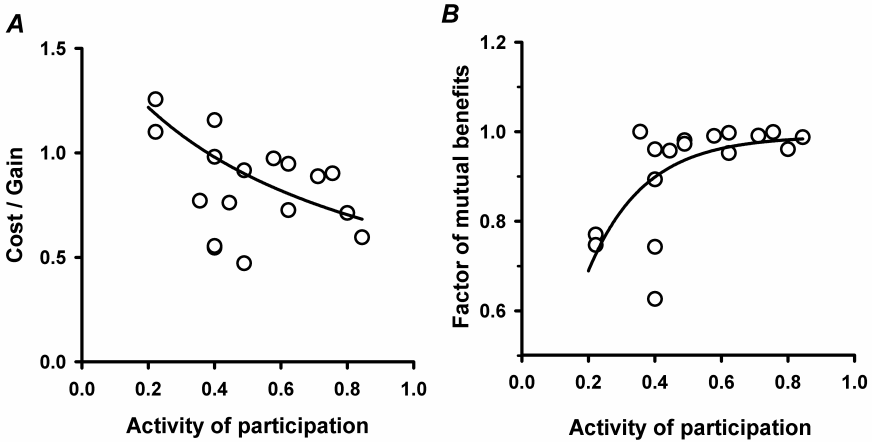

Figure 1: Relationships among informants' costs, gains, mutual benefits and their activity

Figure 1A indicates that: [i] the informants' activity is inversely proportional to their cost/gain (r^2 = 0.43); and [ii] the mean cost/gain (n = 17) is 0.91 ± 0.35 (S.D.M) that is a reasonable balance between the informants' costs and gains.

Figure 1B shows the relationship between the informants' activity and the factor of their mutual benefits (F) which is expressed as

$$F = 1/\exp(S+D)$$

where the beneficial factor of demand = D = (G-C)*G/C;

the beneficial factor of supply = S = (C-G)*C/G;

C and G are each informant's total costs and gains respectively.

During knowledge sharing in the KSE, each informant might play both demand and supply roles. Both knowledge users and suppliers tended to decrease their costs and increase their gains, and their benefits might affect their activity. During knowledge exchange the users' gains could be the suppliers' costs, and in contrast the suppliers' gains could be the users' costs. Therefore, the benefits among the informants could conflict with each other. The resulting graph indicates that: [i] the informants' activity correlates with the factor of mutual benefits (r^2 = 0.37); [ii] the mean factor (n = 17) is 0.89 ± 0.1535 (S.D.M) and [iii] the mean activity (n = 17) is 0.52 ± 0.19 (S.D.M).

5 Discussion

From the empirical study, it showed that the participants' knowledge sharing activities were influenced by their assessment on the fulfilment of their expected costs and gains. This was echoed in both the qualitative comments and in the results from the statistical analysis. It was, however, found that their expectations might change during the different periods of their participation (i.e. Initiation, Interaction and Harvest). It was also indicated that there was a correlation between mutual benefits and the level of participation.

Benefit is the main driving force to participation, which is essential to the sustainability of knowledge sharing e-community. The most beneficial resources in a knowledge sharing e-community are the knowledge that is exchanged. However, individual's benefits may conflict among the participants, as they may act both as suppliers and users in knowledge sharing. and one participant's gains could be the costs to another. In order to balance the benefits among the participants, knowledge sharing should be based on a reciprocal relationship and/or agreement. The approach of this

study may be used to monitor the level of the mutual benefits that may be estimated and adjusted based on individuals' expectations and/or agreements.

As a pioneer test, a possible way has been established in this study to estimate the relationship between participants' activity and the mutual benefits or cost/gain, although the sample is limited and the result is preliminary. To implement the approach above, further studies are needed for improving the mathematical expression of demand and supply in knowledge sharing, as well as an initiation into the reciprocal agreements among the participants.

6 Conclusion

Online knowledge sharing plays an important role in scientific education and research. Based on the indications from previous studies on motivations for knowledge sharing, economic principle of demand and supply were used to propose a hypothesis that mutual benefits have a positive effect on participation and contribution in online knowledge sharing.

A new angle was adopted for the investigation on the sustainability of knowledge sharing e-community. Drawing from economic and social theories, a number of factors were identified as the units for analysis and a mechanism (i.e. the mutual benefit) was established to estimate the level of mutual benefits based on the analysis of supply and demand.

The empirical study was used to apply the framework for analysis and the results demonstrated a positive correlation between mutual benefits and the level of participation. Hence, for a sustainable e-community of knowledge sharing, designers and champions of these environments should consider how to maximise the 'mutual benefits' for their participants.

Appendix

Variables	Items in units of analysis
Cost (amount of effort/time or amount/value)	Providing content
	Replying to help-seekers' questions
	Commenting on the shared content
	Looking for/view content
	Looking for/view comments on the shared content
	Contents provided
	Replies provided to help-seekers
	Comments provided on the shared documents
Gain (amount /value or value)	Content received
	Replies to questions received
	Comments on the shared content received
	Chances in sharing and discussing ideas with other users
	Social network in the KSE relating to research work.
Participation (activity)	Providing/updating content
	Replying to help-seekers' questions
	Commenting/raising topics for discussion on the content shared
	Viewing content posted by other people
	Asking questions
	Viewing comments posted by other people on the shared content
	Discussions

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