THE FUNCTIONAL MECHANISMS AND KEY FACTORS FOR THE ENERGY TECHNOLOGY KNOWLEDGE-SHARING WEB-BASED PLATEFORM

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ABSTRACT

The establishments of knowledge-sharing platforms have transcended the limitations of time and space via network technologies, allowing people from different corners of the world to share knowledge, search for information, and even jointly create new knowledge. Employing a domestically designed and developed knowledge-sharing platform, called "Energy Magician", as the field of study, and using participating students in its knowledge sharing as the subjects, this research devises a web-based survey to explore how the participants with different personal characteristics value the key factors of functional mechanism design, reward system, and knowledge sharing of the platform.

The research found that the contestants valued differently the various key factors such as the reward system, the platform's functional mechanisms, and sustained knowledge sharing. Contestants in different groups with disparities in variables such as prior experience in using the platform, usage duration, and degree of participation, valued the platform's reward system differently. Moreover, contestants in different groups ordered the importance of the platform's functional mechanisms in distinct ways. As for the key factor of sustained knowledge sharing, contestants with prior experience in web-based knowledge sharing valued the "cultivation of abilities in data compilation"; elementary school students valued "level titles and privileges" and "cash and prize rewards", while contestants with high degrees of participation valued the "joy in knowledge sharing", "joy of participating in the contest", and "level titles and privileges" most.

Keywords: knowledge sharing, reward system, Energy Magician, key factor

1 INTRODUCTION

According to the "Survey of Network Usage in Taiwan" conducted by the Taiwan Network Information Center in March 2012, it was estimated that there were 15,936,977 people, about 69% of the total population, who had used the Internet [1], indicating that using the Internet has become an important experience in people's daily lives and that people can complete many tasks quickly and conveniently through the Internet. Meanwhile, under the government's active promotion of information technology education in elementary and high schools, the Internet has really become an indispensible tool in

the daily lives of the students.

Surveys have indicated that students receiving web-based learning rewards have higher web-based learning willingness than those not receiving them, and students receiving web-based learning rewards in the groups with scores and titles perform better in the comment-and-reply aspect, as measured in the degree of participation in web-based learning, than students not receiving the rewards. Additionally, all students receiving different reward mechanisms express positive affirmation for web-based learning. Therefore, reward mechanisms are a very crucial factor for web-based learning [2].

The "Energy Magician" knowledge-sharing platform was created primarily in response to the Life Energy-Saving Creativity Contest sponsored by the National Science Council of the Executive Yuan. Its main goals were to expand the breadth and depth of the contestants' concepts in "energy saving and carbon reduction" and provide the web-based platform for the participants to share knowledge in energy technologies, discuss, communicate and exchange ideas, and to reinforce the contestants' motivation for participation using such incentives as point accumulation and the advanced title of "Energy Magician" after sufficient points were earned. On such a knowledge-sharing platform with conspicuous themes, the elementary and high school students participating in the contest all had different backgrounds as well as habits in using the Internet. Would they exhibit distinct disparities in their responses to the various functional mechanisms of the platform design? Targeting the students participating in the knowledge sharing, the researchers have designed and conducted a web-based survey, in a hope to explore how the contestants with different personal characteristics would value the key factors of the functional mechanisms design, reward system, and knowledge sharing of the platform.

2 PURPOSES OF RESEARCH

This research uses the contestants participating in the "Energy Magician" knowledge sharing platform of the Life Energy-Saving Creativity Contest as the subjects to explore how they value and operate the various functions of the platform, and analyzes the key factors affecting the contestants' participation in the knowledge sharing, in a hope to answer the following questions:

2.1 Due to their different background variables, would the participants value the platform's functional mechanisms differently?

2.2 Are the key factors for participating in the knowledge sharing different among contesting students of different groups?

3 LITERATURE REVIEW

3.1 Knowledge sharing and the functional mechanism of web-based platform

The popularization of the Internet and the advancement in communication technology have transcended the limitations of time and space and allowed social communities to connect with people in different regions. Especially via the application of Web 2.0, the functions of the Internet have expanded from fast data search and file and information sharing to advancing towards the development of bidirectional interactive information media, which integrates synchronous and asynchronous modes to create a diverse learning environment [3]. Internet communities offer a group of participants who have the same interest with a clustering area to interact, share,

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discuss, and think. Members of the Internet communities are provided a safe space to share knowledge and explore knowledge from various fields, thus increasing the depth and width of knowledge flow by integrating the ideas, concepts, and thinking logics of each others' [4]. Participants of the Internet communities are brought together from all over the world and constantly learn and grow through conversing with each other, followed by self-reflection [5].

The knowledge-sharing platform of the present study focuses on the open platforms commonly used in elementary schools and junior and senior high schools, which are distinct from the knowledge-sharing platforms constructed for knowledge management (KM) in industries or the platforms built by professional social communities. Yahoo Kimo Knowledge Plus and Wikipedia are the most frequently used knowledge sharing networks among Taiwanese students. Wikipedia is a collaborative multilingual encyclopedia project based on Wiki technology, in which anyone can participate in editing any article or entry therein; it is to date the largest Wiki system in the world [6]. Yahoo Kimo Knowledge Plus is an online knowledge-sharing platform, which combines the different experiences and skills of the Internet users; users of the platform communicate through Q&As and ratings and can accumulate credits and upgrade levels. A comparison of the sharing preference between the two knowledge platforms showed that a higher percentage of students are more willing to share knowledge on Yahoo Kimo Knowledge Plus. The reason was that many participants thought the content format of Wikipedia is more professional and rigorous and were thus convinced that they do not have sufficient professional knowledge to share on Wikipedia. Consequently, students usually refer to Yahoo Kimo Knowledge Plus for knowledge searching when encountering general questions, but for more specialized questions, they would turn to Wikipedia for more professional information [7].

Although Yahoo Kimo Knowledge Plus and Wikipedia both enable the general public to search and share knowledge, the different platform setups have led to significant difference in their functions. The "Energy Magician" knowledge-sharing platform designed in this study focuses on energy saving issues and adopts a construction model similar to that of Yahoo Kimo Knowledge Plus. The objective is to strengthen participants' motivation by a credit accumulation mechanism in which participants share, discuss, and exchange their opinions on knowledge of energy technologies to obtain credits in order to claim the advanced level titles of the "Energy Magician".

3.2 Factors influencing knowledge sharing and the reward systems of web-based platform

The objective of an online knowledge-sharing platform is to provide convenience for the Internet users and the design of different reward systems is to improve users' involvement. The establishment and connection of Internet communities require consistent inner motivations, such as the need to satisfy one's curiosity, exploration, and joy; hence, the design of function and content must be supported by frequently updated contents and interesting information [8]. The willingness of the community members to share knowledge depends on the operability of the interface, mutual trust, recognition of the platform, and the contribution of knowledge sharing [9].

Virtual communities often use different reward mechanisms to improve user's loyalty to the community. Among the reward mechanisms

commonly used in virtual communities, offering additional account privileges, application for webpage manager, and special credit accumulation methods are the three reward mechanisms most valued by virtual community members [10]. In addition to the reward mechanisms implemented on the websites, there are many factors that prompt the users to share their knowledge online; for example, having helpful personalities, receiving positive feedbacks, and establishing good interpersonal relationships all have positive impact on user's attitudes towards knowledge sharing [11].

Chiu, Hsu and Wang [12] constructed a model using social cognitive theory and social capital theory to study the motivations of virtual community members for knowledge sharing, and showed that knowledge sharing of the members is influenced by social capital factors, such as social interaction and relationship, mutual trust, norm of reciprocity, evaluation, common vision, and common language. Chen and Huang[13] utilized online surveys to investigate the influence of Yahoo Kimo Knowledge Plus users' motivation, attitude, and altruism towards knowledge sharing on the willingness of sharing knowledge on the Internet. The researchers divided the motivation for knowledge sharing into community recognition, reputation feedback, and material rewards, and found that mental mechanisms, including community recognition and reputation feedback, have a greater influence on the motivation and behavioral intention for online knowledge sharing than material rewards.

Chang, Chiu, Geng and Chou[14] discussed the determining factors of user's intention in sharing knowledge from the perspective of the application of blogs and forums, and indicated that the intention to share is influenced by mental mechanisms, such as outer benefits (reputation and reciprocity), inner benefits (enthusiasm in helping others and sense of self-competence), and costs (convenience cost and interaction cost).

Chu, Huang and Tsai[10] suggested in a study on the reward mechanisms for virtual communities that different reward mechanisms affect users of different educational levels, and showed that there is a significant difference in the response to different reward mechanisms between students and non-students, implying the significant influences of different reward mechanisms on users of different educational levels and social statuses.

In sum, a high-quality online knowledge-sharing platform requires complete and convenient web functions and diverse reward mechanisms, as well as suitable personalities of the users. These critical factors have significant impact on the willingness of the participants in continuing their involvement in the knowledge sharing process. In this study, we designed online surveys based on the above literature reviews and analyzed the results according to different background variables.

4 METHODOLOGY

This research adopts a quantitative approach to find out whether such positive psychological encouragements as cash rewards or winnings of more-advanced titles can help motivate the contestants to participate in the knowledge-sharing platform and further prompt them to collect and share energy knowledge. Using a self-compiled questionnaire, the researchers conduct an online survey using the platform.

The research questionnaire is tailored for the functional mechanisms of the website as well as the purposes of the research, and its validity is

reviewed via meetings with experts. The questionnaire has a total of 26 questions in 3 major categories: the reward system, knowledge-sharing factors, and the platform's functional options. The reward system is further subdivided into points reward, psychological reward, and material reward. Using t-test, one-way ANOVA, and other statistical methods, survey data are then analyzed to learn whether various subjects exhibit distinctively different behaviors in the above three categories when participating in the web-based knowledge platform, and to explore the operations and actual effectiveness of the "Energy Magician" knowledge-sharing platform.

The researchers conducted an online survey that lasted from June 15 to August 15, 2009. The survey had a webpage as its frontend and a server as the backend (PERL and MYSQL), and used Javascript at the frontend and PERL at the backend to check for data entry omissions. User login was programmatically restricted by using the account numbers and passwords of the contestants to prevent non-contestants from taking part in the survey. On the other hand, raffle was employed to encourage contestants to more actively participate. A total of 115 contesting teams responded to the online survey, completing 300 questionnaires, of which 239 were deemed valid, after discarding 61 that were not. After reliability tests on the questionnaires, the Cronbach's Alpha for the questions in the categories of points reward system, psychological reward system, and knowledge-sharing factors were found to be .783, .914, and .824, respectively, while the Cronbach's Alpha for the total scale was .934. Since theαvalues for the questions in various categories and the total scale were all above .78, the internal consistency was good.

Table 1. Reliability coefficient table for the survey on participation effectiveness of "Energy Magician"

Survey Category	No. of Questions	α value
Points reward	3	.783
Psychological reward	9	.914
Knowledge-sharing	6	.824

5 RESULTS

5.1 Descriptive statistics

The sample used by this research included 160 males and 79 females, with males being twice as many as females. In other words, the male-to-female ratio was 2:1. The 16-18 age group was the largest, having a total of 115 students or 48.1% of the sample; the 13-15 age group had 52 students or 21.8% of the sample. As for usage experience, 62.8% had prior experience in using similar knowledge-sharing web-based platforms. Most students in the sample (46.0%) spent less than an hour a day on average on "Energy Magician"; 42.7% spent between 1 to 2 hours, while the least number of students spent over 2 hours a day (11.3%). The "Green Energy" contesting group with senior and vocational school students was the biggest, having 116 students or 48.5% of the sample. The "Water Saving" group consisting of elementary school students was the second largest, having 70 people or 29.3%. The "Electricity Saving" group with junior high school students was the smallest, having 53 students or 22.2% of the sample.

Table 2. Statistical distributions of basic sample data

		No	%
Gender	Male	160	66.9
	Female	79	33.1
Experience	Yes	150	62.8
	No	89	37.2
Age	Under 12	32	13.4
	13~15	52	21.8

		No	%
	16~18	115	48.1
	Over 19	40	16.7
Usage duration	Under 1 hour	110	46.0
	1 to 2 hours	102	42.7
	Over 2 hours	27	11.3
Contesting group	Water Saving	70	29.3
	Electricity Saving	53	22.2
	Green Energy	116	48.5
Participation	High	50	20.9
	Medium	58	24.3
	Low	131	54.8

5.2 Degrees of attention to different reward systems displayed by contestants with different characteristics

T-test and one-way ANOVA were used to analyze the degrees of attention to different reward systems of the groups categorized by sex, age, usage experience, usage duration, and degree of participation.

Table 3. Summary of the means and standard deviations of the answers provided by contestants for the reward system survey

Reward System	Mean	S.D.	Questions	Avg
Points reward	12.26	2.24	3	4.08
Psychological reward	36.80	6.20	9	4.08
Material reward	4.24	.92	1	4.24

(a) Gender

Gender was divided into the male and female types, to which t-tests were applied. All the three systems of "points reward" ($t = .233$), "psychological reward" ($t = 1.245$), and "material reward" ($t = .175$) did not display significant differences. Results indicated that there were no significant differences between male and female in the three reward systems.

(b) Age

The statistical data in Table 4 indicate that contestants under 12 years of age are elementary school students, 13~15 years of age are junior high students, and 16~18 years of age are senior high students. One-way ANOVA analysis was performed on different age groups of students. Among the three reward systems, "psychological reward" and "material reward" reached the significant level, but after Scheffe post hoc comparisons, it was found that "psychological reward" did not achieve significant difference. As for the "material reward" system, contestants in the elementary school students group valued "material reward" distinctively higher than those in the senior high students group.

Table 4. Summary of statistical data of contesting groups for various reward systems

Reward	Group	No	Mean	S.D.	t
Points reward	E. school	32	12.81	2.507	2.831
	Junior high	52	12.73	2.215	
	Senior high	115	12.04	1.935	
Psychological reward	E. school	32	38.25	6.725	3.676*
	Junior high	52	38.10	5.661	
	Senior high	115	35.92	5.820	
Material reward	E. school	32	4.63	.707	3.450*
	Junior high	52	4.29	.915	
	Senior high	115	4.14	.990	

*$p < .05$

(c) Usage Experience

Does past experience of particip

ation in similar knowledge-sharing web-based platforms play a role in various reward systems? Using t-tests, only "points reward" was found to have reached significant level, indicating that, for usage experience, whether or not the contestant had prior experience in using similar knowledge-sharing web-based platforms did reach

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the significant level for "points reward". On the other hand, neither "psychological reward" nor "material reward" reached the significant level. Therefore, usage experience makes a significant difference in "points reward." In other words, contestants with prior usage experience valued "points reward" significantly higher than those without.

Table 5. Summary of contestants' usage experience for various reward systems

Reward System	Experience	No	M.	S.D.	t
Points reward	Yes	150	12.50	2.075	2.126*
	No	89	11.87	2.473	
Psychological reward	Yes	150	37.36	5.730	1.822
	No	89	35.85	6.870	
Material reward	Yes	150	4.22	.947	-.493
	No	89	4.28	.879	

*p＜.05

(d) Usage Duration

The average daily online usage durations of the "Energy Magician" website were grouped into "under 1 hour", "1~2 hours", and "over 2 hours." One-way ANOVA analysis was performed on usage durations, which indicated that contestants with different usage durations had significant differences in "points reward" and "psychological reward." After Scheffe post hoc comparisons, it was found that contestants with usage durations of "1~2 hours" and "over 2 hours" valued "points reward" and "psychological reward" significantly higher than those contestants with usage durations "under 1 hour."

Table 6. Summary of contestants' usage durations for various reward systems

Reward System	Duration	No.	M	S.D.	F
Points reward	Under 1 hour	110	11.78	2.67	5.93**
	1~2 hours	102	12.53	1.73	
	over 2 hours	27	13.22	1.94	
Psychological reward	Under 1 hour	110	35.41	7.10	6.66**
	1~2 hours	102	37.54	4.81	
	over 2 hours	27	39.67	5.66	
Material reward	Under 1 hour	110	4.28	.940	.491
	1~2 hours	102	4.18	.938	
	over 2 hours	27	4.33	.784	

**p＜.01

(e) Degree of Participation

Contestants' degrees of participation were grouped into "high" with scores above 2001 (20.9%), "medium" with scores between 601 and 2000 (23.4%), and "low" with scores under 600 (54.8%). One-way ANOVA analysis was performed on the degrees of participation, which indicated that contestants with different degrees of participation had significant differences in "points reward" and "psychological reward." After Scheffe post hoc comparisons, it was found that contestants with "high" and "medium" degrees of participation valued "points reward" and "psychological reward" significantly higher than those contestants with "low" degrees of participation.

Table 7. Distribution of degrees of participation in "Energy Magician"

Degree of Participation	Score	No. of Contestants	Effective %
High	Above 2001	50	20.9
Medium	601 ~ 2000	58	24.3
Low	Under 600	131	54.8
Total		239	100.0

Table 8. Summary of contestants' degrees of participation for various reward systems

Reward System			M	S D	F
Points Reward	High	50	13.38	1.64	12.87***
	Medium	58	12.66	1.58	
	Low	131	11.66	2.49	
Psychological Reward	High	50	38.82	5.68	7.32**
	Medium	58	38.09	3.73	
	Low	131	35.46	6.93	
Material Reward	High	50	4.30	.88	1.847
	Medium	58	4.41	.70	
	Low	131	4.15	1.00	

**p＜.01 ***p<.001

5.3 Analysis of the degrees of attention to the functional design of web-based platforms versus different degrees of knowledge sharing

"Energy Magician" has a total of 20 crucial functional mechanisms. Table 9 lists the distribution of the top 8 functional mechanisms most selected by contestants. The top 5 most-selected functional mechanisms, in descending order, were Reply, Inquiry, Best Answer, Prize and Cash Rewards, and Today's Group Ranking. Results indicated that contestants valued these five functional mechanisms most.

Multiple-selection questions were used to cross-analyze the high, medium, and low participation contestants with the functional mechanisms of Reply, Inquiry, Today's Group Ranking, Prize and Cash Rewards, and Best Answer. Results indicated that among the top five crucial functional mechanisms selected by the contestants, only Today's Group Ranking was valued by a significant 60% of high-participation contestants, distinctively higher than the 49.1% of medium-participation contestants and the 20.9% of low-participation contestants.

Table 9. Distribution of Energy Magician's top 8 most-selected crucial functional mechanisms

Functional Mechanism	No.	Percentage	Order
Reply	144	60.3%	1
Inquiry	114	47.7%	2
Best Answer	109	45.6%	3
Prize and Cash Rewards	93	38.9%	4
Today's Group Ranking	85	35.6%	5
Evaluation	75	31.4%	6
Prime Area	72	30.1%	7
Hot Topics	67	28.0%	8

5.4 Are the key factors for participation in the knowledge sharing different among contesting students of different age groups?

Contestants were grouped by age into elementary school students (under 12 years old), junior high students (13 ~ 15 years old), and senior high students (16 ~ 18 years old). One-way ANOVA analysis was performed on the knowledge-sharing key factors, which indicated that, among different student groups of key factors, "level titles and privileges" and "cash and prize rewards" made significant differences, both of which were higher among elementary school students than senior high students.

Table 10. Summary of knowledge-sharing key factors among different groups of contesting students

Key Factor	Student Group	No	M	S.D.	F-test
Joy in knowledge sharing	Elementary school	32	4.56	.50	1.70
	Junior high	52	4.58	.57	
	Senior high	115	4.41	.66	

Key Factor	Student Group	No	M	S.D.	F-test
Self affirmation & sense of achievement	Elementary school	32	4.41	.56	.49
	Junior high	52	4.54	.60	
	Senior high	115	4.52	.66	
Cultivation of abilities in data compilation	Elementary school	32	4.31	.69	1.02
	Junior high	52	4.52	.64	
	Senior high	115	4.41	.66	
Exercising creativity	Elementary school	32	4.47	.62	.37
	Junior high	52	4.58	.63	
	Senior high	115	4.49	.71	
Joy of participating in the contest	Elementary school	32	4.38	.66	3.65*
	Junior high	52	4.37	.74	
	Senior high	115	4.03	.95	
Level titles and privileges	Elementary school	32	4.50	.62	3.71*
	Junior high	52	4.15	.80	
	Senior high	115	4.02	.98	
Cash and prize rewards	Elementary school	32	4.63	.70	3.45*
	Junior high	52	4.29	.91	
	Senior high	115	4.14	.99	

6 CONCLUSIONS

From the above statistical analysis of the research, it can be observed that contestants spend relatively more time on knowledge-sharing platforms with contests, and participants with higher degrees of participation distinctively pay more attention to both the points and psychological reward systems. Of course, one could also infer that the more a contestant values the points earned and psychologically identifies with the event, the more he or she would spend time participating. This demonstrates no difference from the discoveries of other pertinent researchers.

As for how participants value the functional design of a web-based platform, the functions that contestants value most are those related to community interactions, such as the Reply mechanism, Inquiry mechanism, and Best Answer. On the other hand, prize and cash rewards and ranking charts are also highly valued, highlighting the importance of a platform's functional interactivity and material rewards to the functional design of a web-based platform.

Based on the analysis on different age groups of the contestants, elementary school students, junior high and senior high school students all have different preferences in the functional design of a platform! Among the various key factors, "level titles and privileges" and "prize and cash rewards" are more attractive to elementary school students. Such incentives closely resemble the small material gifts that elementary school teachers like to hand out in class or the tactics of letting students exchange their collected points for small prizes. All these are worth further researches from the perspective of educational psychology.

Because the subjects of this research included only

the contesting students from different parts of Taiwan who were *willing to* fill out questionnaires via an online survey for research data collection, there were limitations on the sampling. Nevertheless, though the research findings cannot be generalized to all Internet communities, significant discoveries were made regarding elementary and high school students' functional requirements of and degrees of attention to a web-based knowledge-sharing platform, which could be an important reference for constructing relevant knowledge-sharing platforms in the future.

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