An integrative model for knowledge sharing in communities-of-practice
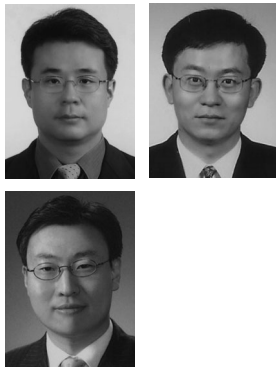
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Abstract

Purpose – This study attempts to identify the factors and relationships that influence community of practice (CoP) members' knowledge-sharing attitudes, intentions, and behaviors.

Design/methodology/approach – The Theory of Planned Behavior model, Motivation Theory, and the Triandis model were employed here. For the empirical validation, 282 responses from four Korean companies were collected.

Findings – Whereas both extrinsic motivational and intrinsic motivational factors positively influenced attitude toward knowledge-sharing behaviors, intrinsic motivational factors were more influential in this regard. Additionally, some differences in knowledge-sharing mechanisms were noted between formally managed CoPs and informally nurtured CoPs.

Research limitations/implications – Since the survey samples used herein were limited to Korean companies, the results of this study may prove ungeneralizable.

Practical implications – For managers who intend to introduce CoPs to their firm, a CoP supportive environment must be created, such that the image, reciprocity, enjoyment of helping, and need for affiliation of each CoP member can be satisfied.

Originality/value – This study is one of the first pieces of integrative research regarding CoPs to target understanding of the most crucial component of CoP activities, namely knowledge sharing.

Keywords Communities, Working practices, Knowledge management, Organizational behaviour, Innovation, South Korea

Paper type Case study

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1. Introduction

Throughout the past decade, knowledge management (KM) has been the primary focus of attention from organizations, which perceive it as a strategic means for innovation and the maintenance of competitive advantage (Chua, 2009). Many firms have implemented KM initiatives with a focus on information technology and have invested significant resources in deploying their KM systems; this enables the sharing of explicit knowledge among employees, by way of a corporate knowledge repository.

However, such systems or repository-based approaches have, thus far, failed to generate the outcomes or business benefits putatively ascribed to KM like the creation and usage of high-quality knowledge and improvements in organizational learning and innovation (Malhotra, 1998; Brown and Duguid, 2002; Garud and Kumaraswamy, 2005). Rather, initiatives in KM systems appear to incentivize firms to manage mostly explicit knowledge and a large quantity of useless data and documents (McDermott, 1999). At one of the largest systems integration companies in Korea, after two years of KM implementation, 70 percent of registered knowledge items originated from outside sources such as the internet or news media, and 83 percent of the 350,000 knowledge items were never used by any of the 5,000 employees (KMRC, 2005).

> **"Within CoPs, the social motivations are anticipated to exert a greater impact on attitudes towards behavior than do personal or economic motivations."**

Communities of practice (CoPs) are beginning to gain some recognition as effective organizational mechanisms, which allow members to voluntarily create and share both implicit and explicit knowledge. CoPs support reciprocal learning as a social process, and function as an alternative to knowledge repository-oriented KM implementation (Swan *et al.*, 2000; Lesser and Storck, 2001; Wenger and Snyder, 2000).

According to the field's original theorists (Brown and Duguid, 1991; Lave and Wenger, 1991), CoPs are largely formed in a voluntary manner and operate informally without formal controls or system supports. However, formal and strategic CoPs have also spread rapidly in Korea, as many firms depend on CoPs as a source of innovation and problem solving (KMRC, 2003).

Despite the proliferation of CoPs in the firms, not much is currently known as to the individual or organizational factors that motivate CoP members' knowledge sharing behaviors. The manner in which knowledge sharing behavior differs between formal and informal CoPs also requires further clarification. Thus, this study poses and empirically addresses the following three questions:

1. What are the socio-psychological factors that affect CoP members' knowledge sharing attitudes?

2. What are the individual, social, and organizational factors that influence knowledge sharing intentions and behaviors?

3. Are there any differences between formal and informal CoPs with regards to the effects of such factors?

This paper is organized into seven sections. The following section describes the theoretical background. Section 3 shows the research model and the hypotheses. In section 4, the research methodology is provided. Section 5 presents the analysis and results of the study, and the implications of the study are addressed in section 6. The final section summarizes the contributions and limitations of this study.

2. Theoretical background

2.1 CoPs: formal vs informal

The concept of CoP was introduced initially by Lave and Wenger (1991). They noted that, in the traditional master-apprentice relationship, the apprentice becomes a member of the profession's community by spending a significant amount of time with the master, and thereby learning the profession gradually and naturally. They categorized this gradual learning process as ''legitimate peripheral participation'' and expressed the relational context in which such learning occurs as the CoP. The learning process in a CoP can be interpreted from a social constructivist perspective. Social constructivism denies the existence of objective knowledge, and holds instead that all knowledge is situated within its relevant context; the validity of such knowledge must then always be assessed in context (Lave, 1988; Wasko and Faraj, 2000).

Wenger and Snyder (2000) defined a CoP as ''a group of people informally bound together by shared expertise and passion for a joint enterprise.'' They imagined that CoPs tend to complement traditional organizational structures, thus helping to fulfill the needs of

organizations in the twenty-first century. Therefore, the formation and operation of a CoP must clearly be both informal and voluntary.

As organizations have been increasingly recognizing the benefits and roles of CoPs, they have begun to link CoPs to strategic business objectives by creating strategic communities or providing strategic support to those communities. Storck and Hill (2000) presented the case of Xerox as an example of the successful application of this principle. In the case of Xerox, a strategic community, consisting of 50 internal IT professionals, was tasked with developing the infrastructure of a corporate information systems; this was regarded as a strategic challenge that, if successfully undertaken, would help the firm maintain its competitive advantage. In this case, the concept of ''strategy'' was added, since the strategic community has a well-defined relationship with the strategic organizational objective. The ''strategic community'' concept was employed to describe a CoP that is formally planned and nurtured by the organization.

At SK Energy, Korea's largest oil company, 1,471 CoPs (formal: 47 percent, informal: 53 percent) have been in operation since 2001. SK Energy attributes the $87 million increase in revenue and the 10 percent increase in productivity solely to the activities of the CoP. At LG Electronics, 9,510 employees have participated in 656 CoPs (formal: 8 percent, informal: 92 percent) since 2000, contributing to the building of core capabilities, cost reductions, and productivity improvements (KMRC, 2003).

According to the research of Saint-Onge and Wallace (2003), CoPs can be divided into three categories: informal CoPs, supported CoPs, and structured CoPs. Supported CoPs and structured CoPs, like strategic communities, are CoPs that are formally authorized and supported by the firm itself. Table I provides the characteristics of each CoP type, adapted from the classifications of Saint-Onge and Wallace (2003):

3. Underlying theories

This study regards knowledge-sharing behavior in CoPs as an individual's social psychological process, in which one's attitude affects intention, and intention subsequently influences the individual's behavior. In order to determine which factors affect CoP members' knowledge sharing attitudes, intentions, and behaviors, the research adopted three background theories: the Theory of Planned Behavior (TPB) model, Motivation Theory, and the Triandis model. The integration of these three underlying theories is provided in Figure 1.

Table I Informal CoPs vs formal CoPs			
		Formal	
Characteristic	Informal	Supported	Structured
Role	Sharing knowledge among practitioners for community's own sake	Building capability for a given business or competency area	Providing a cross-functional platform for organizational problem solving
Membership	Self-joining or peer-invited	Self-joining, member-invited, or manager's recommendations	Invited by sponsors or members with some selection criterion
Level of sponsorship	Very low: sometimes no formal sponsorship	Moderate: sponsored by one or more seniors/managers	High: formally sponsored by executives (or CEO)
Evolution	Naturally developed and working based predominantly on voluntariness	Intentionally developed mainly by sponsor(s) and CoP members	Organizationally developed and well aligned with business objectives; mostly depending on endorsement of members
Motivation	Purely voluntary	Voluntary and mandatory mixed	Mostly mandatory
Rewards	Mostly depending on internal reward (e.g. enjoyability or mutual trust)	Internal and external mixed	Mainly depending on external rewards (e.g. incentives from executives)
Life cycle	Relatively long	Moderate	Sometimes short
Source: Adapted from Saint-Onge and Wallace (2003))			
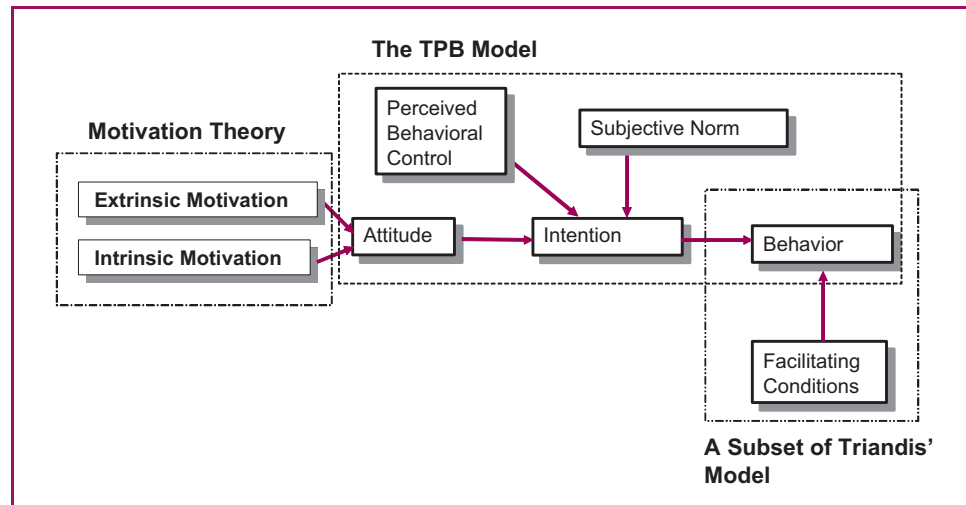
3.1 Motivation Theory

According to the motivation theories, motivation, which drives human behavior, can be divided into two categories: extrinsic and intrinsic motivations.

Extrinsic motivations serve to satisfy indirect or instrumental needs. Money is one of the representative motives, in this regard. An adequate financial reward provides satisfaction independent of the direct outcomes individuals derive from the work itself. Extrinsic motivation can also be satisfied by social rewards. People pursuing social rewards tend to have a relatively greater interest in the social benefits deriving from the acquisition of an opportunity. An anticipated increase in visibility or status within the organization as the result of certain behaviors may serve as an extrinsic social motivation (Frey and Osterloh, 2002). The social rewards can also be understood in terms of the participants' personal benefits involved in social exchange (Blau, 1967). In the context of CoP, social rewards such as reputational or image enhancements, are considered more appropriate, since CoP members create or join their communities as the result of shared enthusiasm for a common cause, rather than as the consequence of anticipating specific economic rewards from the firm.

Intrinsic motivation is spurred by values provided directly within the work itself (Frey and Osterloh, 2002). This study intends to focus the exploration of CoPs on the intrinsic motivation of people as social beings. Altruism is an excellent example of intrinsic motivations existing in people as social beings, as people are motivated by the enjoyment of charity activity itself (Krebs, 1975; Smith, 1981). Humans, as social beings, also desire affiliation for reasons of personal safety (Greenberg, 1991). Within CoPs, the social motivations are anticipated to exert a greater impact on attitudes towards behavior than do personal or economic motivations.

3.2 TPB model

Developed as an extension to the Theory of Reasoned Action (Ajzen and Fishbein, 1980), the TPB includes an additional variable – perceived behavioral control – which refers to situations in which an individual lacks sufficient control over the target behavior (Chau and Hu, 2001). The TPB proposes that human behavioral intentions are determined by three independent factors: attitude, subject norms, and perceived behavioral control (Ajzen, 1991). Attitude represents the predisposition toward the behavior in evaluations or appraisals. Subject norm refers to the extent of perceived social pressures regarding the execution of the target behavior. Perceived behavioral control is defined as the degree to which a person perceives that the decision to engage in a given behavior is under his/her control.

3.3 Facilitating conditions of the Triandis model

The Triandis model is another extension of the TRA model, which incorporates certain context–specific enablers of behaviors, and functions as a basis for a better understanding of human social behavior (Thompson *et al.*, 1991). According to the Triandis model, human behavior is determined by the individual's intentions, which are themselves influenced by social factors, affect, and perceived consequences. At the same time, behaviors are determined by the presence or absence of facilitating (or debilitating) conditions (Triandis, 1980). Facilitating conditions are organizational support systems such as space, promotion, or information systems. The Triandis model provides a theoretical background by which the facilitating conditions can be regarded as enablers of behaviors. In cases in which objective obstacles are present, behaviors will not arise even with high levels of intention.

4. Research model and hypotheses

Our research model is provided in Figure 2. This model may be divided into four major parts. The first part identifies the factors that affect attitudes toward knowledge sharing, whereas the second part of the model identifies the factors that influence intentions toward knowledge sharing. The third part identifies factors that affect knowledge sharing, and the final section examines whether or not the levels of impact exerted by each factor on knowledge sharing attitudes in CoPs differ between formal and informal CoPs.

4.1 Factors affecting attitudes toward knowledge sharing

Human behaviors are influenced not only by internal factors but also by external stimuli (Bandura, 1986). Rewards might be a typical example of such external stimuli within the context of knowledge sharing. In CoPs, where implicit knowledge is shared among members, economic rewards may cause negative perceptions to arise among the members (Osterloh and Frey, 2000). Social image refers to the expectation that one's reputation can be enhanced due to knowledge sharing in CoPs, and is synonymous with the Korean concept of maintaining social ''face'' (Kang, 2004). Triandis (1989) has proposed that ego in an individual comprises individual ego, collective ego, and public ego, and that, among collective individuals, public ego is nurtured more prominently than individual ego.

In firms in Korea, where a collective culture prevails, it would be expected that image and social face would tend to influence one's attitude toward knowledge sharing. Even in the

Figure 2 Research model and its hypotheses
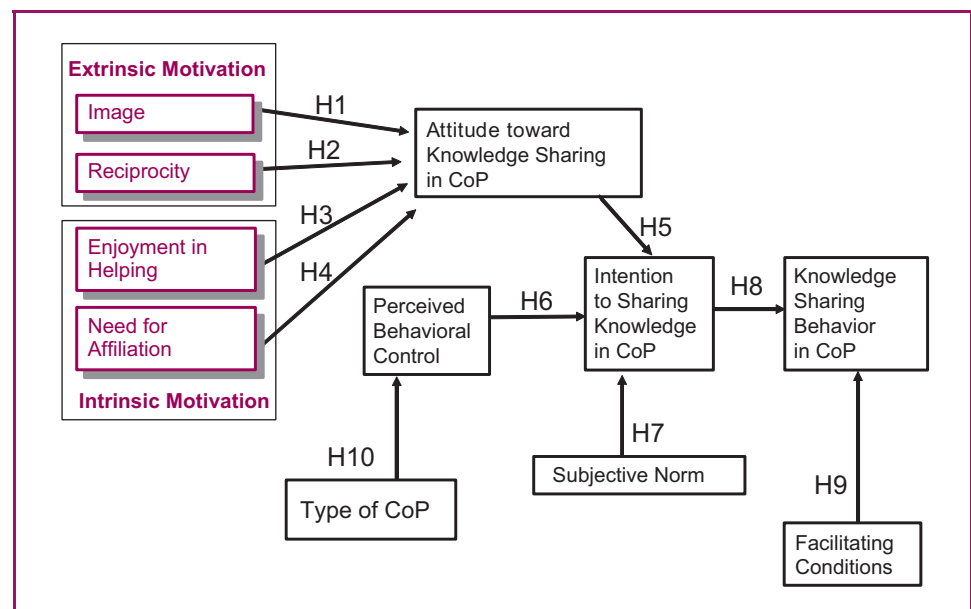
context of Western business, image or social face might elicit a positive attitude toward knowledge sharing, as collective community cultures are detected frequently in the context of CoPs (Brown and Duguid, 1991; Lave and Wenger, 1991):

   H1. Image will have a positive effect on CoP members' attitudes toward knowledge sharing.

Reciprocity is another extrinsic social psychological motivational driver of knowledge sharing in CoPs. Reciprocity functions as a crucial motivation for participants engaging in social exchanges (Blau, 1967). Reciprocity entails a social ''give and take'' relationship. When one member of a CoP shares his knowledge with other CoP members, if reciprocity holds, he would anticipate receiving the required knowledge from other CoP members. A positive relationship has been noted to exist between the knowledge-sharing behavior of online community members and community members' perceived reciprocity (Wasko and Faraj, 2000; Reingold, 2000; Koh and Kim, 2004). According to the study of Bock *et al.* (2005), reciprocity will affect one's knowledge sharing attitudes first, before it ultimately results in more active knowledge-sharing behavior in CoPs:

   H2. Reciprocity will have a positive effect on CoP members' attitudes toward knowledge sharing.

The enjoyment of helpful behavior is related to altruism. Altruism differs from reciprocity in that it involves helping others with no expectation of reciprocity. Consequently, altruism may be closely related to intrinsic motivation. Osterloh and Frey (2000) have argued that knowledge sharing activity is motivated by one's own intrinsic motivations. Wasko and Faraj (2000) have also demonstrated that individuals are intrinsically motivated to contribute their knowledge because they enjoy helping others. As knowledge sharing behavior helps other CoP members to solve their problems, a CoP member who enjoys helping other members is likely to harbor a positive attitude toward knowledge sharing (Kankanhalli *et al.*, 2005).

   H3. Enjoyment in helping will have a positive effect on CoP members' attitudes toward knowledge sharing.

The need for affiliation is described as the tendency to be gratified by engaging in harmonious relationships (Murray, 1938). Murray's concept of affiliative motivation is defined as affection, or as a feeling associated with liking and loving (Hill, 1987). Greenberg (1991) has argued that the motivation to affiliation is more intrinsic, and is a fundamental motivation associated with the safety drive, and that the safety drive moves people closer to others within a social network. Kadushin (2002) has determined that safety needs and affiliation motivations can be generated from the networks of cohesion to which the CoPs belong. Sharing one's knowledge with other CoP members involves a certain degree of personal sacrifice (e.g., threat to job security, risk of exposing one's weakness) (Wasko and Faraj, 2000; Ardichvilli *et al.*, 2003). As such sacrifices can facilitate the establishment of relationships with other members and strengthen one's CoP affiliation, greater need for affiliation may result in more positive attitudes toward knowledge sharing:

   H4. The need for affiliation will have a positive effect on CoP members' attitudes toward knowledge sharing.

4.2 Factors affecting intention toward knowledge sharing

The TPB asserts that attitude, perceived behavioral control, and subjective norms influence members' intentions. Therefore, *H5*, *H6*, and *H7* are based on the TPB model:

   H5. Attitude will have a positive effect on CoP members' intentions toward knowledge sharing.

   H6. Perceived behavioral control will have a positive effect on CoP members' intentions toward knowledge sharing.

   H7. Subjective norms will have a positive effect on CoP members' intentions toward knowledge sharing.

4.3 Factors affecting knowledge sharing

H8 evaluates the relationship between intention and behavior. This relationship is also proposed by the TPB:

> *H8.*   Intention will have a positive effect on CoP members' knowledge sharing behavior.

Triandis (1980) defines facilitating conditions as objective factors that observers can agree render an act easy to carry out. Facilitating conditions or organizational support systems (e.g., CoP sponsor, instruction, promotion, information system, etc.) are believed to generate an enabling condition that fosters more active knowledge sharing by CoP members (Wenger and Snyder, 2000). The cultivation of CoPs without proper facilitating conditions has been shown to give rise to unexpected native consequences (Garud and Kumaraswamy, 2005):

> *H9.*   Facilitating conditions will have a positive effect on CoP members' knowledge sharing behavior.

4.4 Moderating effect of CoP type

As listed in Table I, the characteristics of a formal CoP differ from those of an informal CoP (i.e. purpose, membership, organizational support, etc.). For extrinsic motivation drivers such as image or reciprocity, it is anticipated that their impact on attitude will be stronger in a formal CoP than in an informal CoP. On the other hand, the effects of intrinsic motivation factors (including enjoyment in helping and need for affiliation) on attitudes will tend to be stronger in an informal CoP than in a formal CoP. When persons participate in society under conditions in which two positions exist for a given person within the networks of social relationships, they will essentially manifest two selves, fulfilling the two role expectations, and thus will embody two distinct behavioral options (Stryker, 1980). As different networks of social relationships and role expectations exist, different behavioral options may exist:

> *H10.*   The strength of relationships between motivational drivers and knowledge sharing attitudes will differ by the type of CoP.
>
> *H10-1.*   The impact of extrinsic motivational drivers (image, reciprocity) on knowledge sharing attitudes will be stronger in formal CoPs than in informal CoPs.
>
> *H10-2.*   The impact of intrinsic motivational drivers (enjoyment in helping, need for affiliation) on knowledge sharing attitudes will be stronger in informal CoPs than in formal CoPs.

5. Research methodology

To test the research model, this study adopted the survey method, and evaluated the given hypotheses via the partial least squares (PLS) method for analysis. The unit of analysis was individual.

5.1 Measurements

The questionnaire items of this study were developed by adapting measures that were previously validated by other researchers. Image, reciprocity, and enjoyment in helping were measured by adapting Kankanhalli *et al.*'s (2005) variables for the CoP context. Need for affiliation was measured with the scale developed by Hill (1987). Attitude, subjective norm, and intention measurements were based on the examples provided by Bock *et al.* (2005).

> " **Despite the proliferation of CoPs in the firms, not much is currently known as to the individual or organizational factors that motivate CoP members' knowledge sharing behaviors.** "

Perceived behavioral control measurements were adapted from the work of Chau and Hu (2001). In order to eliminate any possible scaling issues, the subjective norm scores were normalized after normative beliefs on knowledge sharing were multiplied by motivation to comply. The facilitating conditions variable was adapted from the study of Thompson *et al.* (1991) and the items included firm-level supports of consultants, information systems, sponsors, and time resource. The dependent measure, knowledge sharing in CoPs, was adapted from the work of Bock and Kim (2002) to make it appropriate for the CoP context.

The definition of each construct and its questionnaire items are provided in Appendix 1, Table AI and Appendix 2, Table AII, respectively. All variables were measured on five-point Likert-style scales (1 = strongly disagree, 5 = strongly agree).

5.2 Data collection

The study sample included 282 employees of four large Korean high-tech production companies. All four companies fulfilled the following criteria:

- successfully operating CoPs for over two years;
- having a stable CoP support system in place; and
- were supportive and cooperative in the implementation of this study.

In evaluating a stable CoP support system, it was assessed whether the company has designated CoP support to provide resources (time, space, information system, etc.) for CoP participants. Brief profiles of the participating companies are shown in Table II.

The CoPs selected for the surveys were again chosen based on the following criteria:

- CoPs with both online and offline activities;
- CoPs with ten to 40 members; and
- CoPs after at least one year of activity.

Whether the CoP was designated as formal or informal was determined on the basis of the criteria provided in Table I. Among the 282 samples employed herein, 125 were designated as formal CoPs and the other 157 as informal CoPs.

The research controlled the survey such that the responses should have come only from the currently active CoP members. As is shown in Table III, 74 percent of the respondents were in their 20s, and approximately 90 percent were male and university graduates.

6. Analysis and results

The PLS was used because it was deemed appropriate for assessing the theories during the early developmental stages (Fornell and Bookstein, 1982). The PLS was selected as an appropriate method for this study, as it is the first initiative to integrate three different theoretical perspectives for the study of knowledge sharing behavior in CoPs.

6.1 Measurement model

To validate the measurement model, convergent validity and discriminant validity were evaluated. To determine the convergent validity, composite reliability and average variance

Table II	Company profile			
Product	Company A LCD	Company B LCD glass	Company C Digital parts	Company D Mobile phones
Total number of employees	14,000	2,100	1,400	8,500
Total sales revenue (billion US$)	8.8	1.1	0.7	11.9
Period of business (years)	10	10	22	20
Period of CoP support (years)	2	2	2	6
Number of respondents	129	81	32	30

Table III	Profile of respondents		
Measure	*Items*	*Frequency*	*Percent*
Gender	Male	246	87.2
	Female	36	12.8
Age	21 ∼ 25	48	17.0
	26 ∼ 30	160	56.7
	31 ∼ 35	60	21.3
	36 ∼	14	5.0
Position	Employee	195	69.1
	Chief employee	58	20.6
	Manager	29	10.3
Work experience (in years)	Less than 2	137	48.6
	2 ∼ 4	87	30.9
	4 and above	38	13.5
Education	High school	28	9.9
	University	195	80.0
	Master	38	13.5
	Doctor	13	4.6
CoP experience (in years)	Less than 1	67	23.8
	1 ∼ 2	164	58.2
	2 and above	51	18.0

extracted (AVE) were calculated (Hair *et al.*, 1998). In the studies involving PLS analysis, 0.7 is the minimum recommended level of reliability (Chin, 1998) and 0.5 is the minimum acceptable level of the AVE (Fornell and Larcker, 1981). In this study, the composite reliabilities ranged from 0.900 to 0.954, and the AVE values were 0.593 to 0.837, exceeding the threshold values for satisfactory convergent validity (see Table IV). In order to evaluate the discriminant validity, the square root of each variable's AVE value was compared with the correlation coefficients between variables. In Table V, for each variable, the square root of the AVE value was larger than the correlation coefficient values with any other variable, thereby verifying the discriminant validity of this study.

6.2 Structural model

With an adequate measurement model, the proposed *H1-H9* were tested via PLS. As can be observed in Figure 3, all of the hypotheses were supported. The results are reported in the following sequence: social psychological antecedents to the TPB model (*H1-H4*), standard TPB constructs (*H5-H8*) and facilitating conditions (*H9*).

H1-H4 were all supported. Based on the results of PLS analysis, image, reciprocity, enjoyment, and the need for affiliation positively triggered the members' attitudes toward knowledge sharing. The results obtained with the standard TPB constructs (*H5-H8*) were as anticipated. Attitude, perceived behavioral control, and subjective norms were related positively to knowledge sharing intentions. Additionally, intention resulted in an increase in actual knowledge sharing behavior. This result demonstrates that the TPB may prove to be a valuable theoretical foundation for the elucidation of knowledge sharing behaviors in CoPs.

Finally, facilitating conditions, which include CoP sponsors, support teams, information systems, and slack resources, positively influenced knowledge-sharing behaviors (*H9*). Such results demonstrate that the TPB model and the Triandis model might possibly be employed in an integrated fashion.

In order to test *H10*, this study divided the sample into formal CoP members ($n = 125$) and informal CoP members ($n = 157$), and then compared the results. The statistical comparison between them was conducted via the procedure established by Keil *et al.* (2000):

$$S_{pooled} = \sqrt{\{[N_1 - 1]/(N_1 + N_2 - 2)\} \times SE_1^2 + [(N_2 - 1)/(N_1 + N_2 - 2)] \times SE_2^2\}}$$

Table IV	PLS confirmatory factor analysis result					
Measure	Items	Composite reliability	Average variance extracted	Loading	Standard error	t-value
Image	IM1	0.9000	0.6932	0.8316	0.0286	29.2717
	IM2			0.8466	0.0247	34.2310
	IM3			0.8922	0.0178	50.4034
	IM4			0.7539	0.0445	17.0552
Reciprocity	RE1	0.9212	0.7452	0.8762	0.0180	49.4080
	RE2			0.8633	0.0218	39.4403
	RE3			0.8673	0.0231	37.2552
	RE4			0.8458	0.0199	42.4415
Enjoyment	EN1	0.9536	0.8374	0.9188	0.0113	81.5998
	EN2			0.9267	0.0106	87.5067
	EN3			0.8582	0.0257	33.0621
	EN4			0.9540	0.0114	83.1128
Need for affiliation	NA1	0.9230	0.7060	0.8561	0.0195	44.0556
	NA2			0.8738	0.0156	56.2120
	NA3			0.8543	0.0198	43.6874
	NA4			0.7622	0.0372	20.5313
	NA5			0.8503	0.0192	44.5135
Perceived behavioral control	PBC1	0.9312	0.7718	0.8862	0.0163	54.3912
	PBC2			0.8867	0.0169	52.6775
	PBC3			0.8778	0.0191	45.7672
	PBC4			0.8632	0.0229	37.4777
Subjective norm	SN1	0.9479	0.7522a	0.8548	0.0206	41.1468
	SN2			0.8811	0.0170	50.9772
	SN3			0.8714	0.0188	46.2397
	SN4			0.8676	0.0178	48.7244
	SN5			0.8741	0.0185	47.2421
	SN6			0.8543	0.0231	37.4432
Facilitating conditions	FC1	0.9104	0.5926	0.7367	0.0414	18.1034
	FC2			0.7310	0.0351	20.6793
	FC3			0.7410	0.0379	19.6293
	FC4			0.7960	0.0291	27.4738
	FC5			0.7939	0.0321	24.7397
	FC6			0.8255	0.0275	29.6543
	FC7			0.7596	0.0364	20.9711
Attitude	ATT1	0.9320	0.7331	0.8074	0.0249	32.2517
	ATT2			0.8846	0.0299	29.2716
	ATT3			0.8010	0.0264	30.3748
	ATT4			0.8958	0.0180	49.9740
	ATT5			0.8871	0.0159	56.2823
Intention	IN1	0.9322	0.7749	0.8891	0.0150	59.7278
	IN2			0.8406	0.0260	32.3122
	IN3			0.8984	0.0142	63.3810
	IN4			0.8918	0.0162	54.5008
Behavior	B1	0.9184	0.7381	0.8683	0.0167	52.5548
	B2			0.8084	0.0260	30.7583
	B3			0.8838	0.0180	49.6264
	B4			0.8740	0.0171	50.4802

$$t = (PC_1 - PC_2) / \left[S_{pooled} \times \sqrt{(1/N_1 + 1/N_2)} \right]$$

where

S_{pooled} = pooled estimator the variance;

t = t-statistic with $N_1 + N_2 - 2$ degree of freedom;

N_i = sample size of dataset for CoP i;

SE_i = standard error of path in structural model of CoP i; and

PC_i = path coefficient in structural model of CoP i (CoP$_1$: formal CoP; CoP $_2$: informal CoP).

	IM	RE	EN	NA	ATT	PBC	SN	INT	FC	BE
Table V	Correlation between constructions									
IM	0.833									
RE	0.398	0.863								
EN	0.418	0.511	0.915							
NA	0.389	0.469	0.497	0.840						
ATT	0.361	0.467	0.538	0.512	0.856					
PBC	0.317	0.312	0.343	0.348	0.235	0.879				
SN	0.405	0.427	0.460	0.367	0.479	0.494	0.867			
INT	0.419	0.455	0.393	0.398	0.481	0.381	0.479	0.880		
FC	0.405	0.386	0.417	0.371	0.255	0.227	0.333	0.215	0.770	
BE	0.334	0.326	0.332	0.371	0.275	0.425	0.464	0.550	0.347	0.859

Note: The italicized numbers in the diagonal row are square roots of the average variance extracted IM: Image; RE: Reciprocity; EN: Enjoyment; NA: Need for affiliation; ATT: Attitude; PBC: Perceived behavioral control; SN: Subjective norm; INT: Intention; FC: Facilitating conditions; BE: Behavior

Figure 3 Results of PLS analysis

Notes: $*p \leq 0.5$, $**p \leq 0.01$, $***p \leq 0.001$
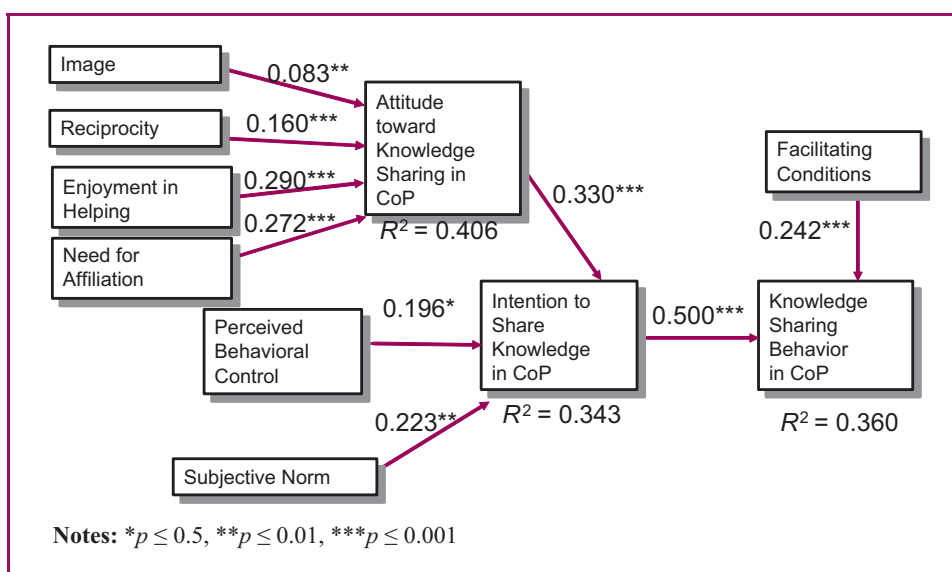
As shown in Table VI, the effects on attitudes toward image and reciprocity revealed statistically more profound results in the formal CoP respondent group relative to the informal CoP respondent group ($t = 23.330$, $p < 0.01$; $t = 9.158$, $p < 0.01$). On the other hand, the effects of ''enjoyment in helping'' and ''need for affiliation'' were greater in the informal CoP group ($t = 1.751$, $p < 0.1$; $t = 20.938$, $p < 0.01$). So, *H10* is supported.

Table VI Comparison between formal CoPs and informal CoPs

Comparison	Hypothesis	t-value
Formal > informal	Image → attitude	23.330
	Reciprocity → attitude	9.158
Formal < informal	Enjoyment in helping → attitude	1.751
	Need for affiliation → attitude	20.938

7. Discussion and implications

7.1 Discussion of the findings

The path coefficient values from Figure 3 show that enjoyment of helping or need for affiliation exert greater impacts on attitude than does image or reciprocity. Considering that enjoyment of helping and need for affiliation are intrinsic motivations, whereas image and reciprocity are extrinsic motivations, these results demonstrate that the intrinsic motivations of CoP members exert a greater impact on knowledge sharing attitudes than do their extrinsic motivations. The finding implies the importance of spontaneity in active CoP participation, since CoP is fundamentally based on the voluntary activities of its members. Although many organizations continue to place a great deal of emphasis on extrinsic motivation, this method may occasionally prove ineffective. Instead, they can achieve superior performance by fostering a work environment that unleashes the intrinsic motivation, passion and interest of their employees. Thus, the various methods by which firms can stimulate and develop intrinsic motivation in their employees need to be explored in future studies.

Considering the effects of social psychological motivational factors on knowledge sharing attitudes in CoPs, individuals in charge of corporate knowledge management may need to realize that social psychological rewards can have a positive impact on CoP members' attitudes toward knowledge sharing. In order to motivate CoP members to develop more positive attitudes toward knowledge sharing, efforts should be made to catalogue the variety of relevant social psychological motivation drivers beside those evaluated herein.

In addition to personal attitudes, subject norms and perceived behavioral control have been shown to affect the development of intentions toward knowledge sharing. As for subjective norms and attitude, Bock *et al.* (2005) assessed the linkages of these factors to knowledge sharing intentions; thus, this study contributes to a reconfirmation of the relationship in the CoP context, and may constitute an initial step toward confirming whether the perceived behavioral control influences knowledge sharing intentions.

This study is also significant in that it reconfirms that intention exerts a positive effect on knowledge sharing behavior, and that a firm's support system affects CoP member's knowledge sharing behavior as a set of facilitating conditions. From the perspective of a CoP support system, the results verified that facilitating conditions (e.g. education programs, promotion programs, consulting programs, information systems, sponsors, or offline meeting space and time) all exert a positive effect on knowledge sharing behavior.

For members participating in a formal CoP more profound positive attitudes toward knowledge sharing were formed by anticipating improvements in the members' images as well as expectations regarding the implementation of reciprocal exchange. On the contrary, the effects of levels of enjoyment of helping behavior and need for affiliation on attitudes toward knowledge sharing were higher in the informal CoP respondent group than in the formal CoP group. Because enjoyment of helping behavior and the need for affiliation are basically intrinsic in nature, and are associated with behaviors such as helping others and building harmonious relationships, they appear to exert more profound effects in the informal CoP group. Interestingly, this finding is similar to the results of a comparative study of two types of CoPs: top-down and voluntary (Koh and Om, 2006). According to the researchers, in purely voluntary CoPs, community stimulation depends heavily on all of the community characteristics, including usefulness and leadership, whereas in top-down or mandatory CoPs, community stimulation is only partially affected or completely unaffected, by such characteristics. If these community characteristics are close to the intrinsic motivation factors, the pure passion and interest held by informal CoP members may prove difficult to preserve.

For example, in the case of Samsung Electronics, the authors had the opportunity to observe the two different types of CoPs: formal and informal. One of the most noteworthy informal CoPs at Samsung Electronics was the ''Feb Community'' in which personnel discuss the variety of fabrication issues in their factory. They voluntarily created their CoP and exhibited passion and interest in practice. Thus, the CoP established a working mechanism by

fostering prolonged intrinsic motivation in the staff. However, in a formal CoP, the ''China Research Community'' (launched by the head of the China Market Department), extrinsic motivation was perceived to be a more important factor than intrinsic motivation. The CoP appeared to be vulnerable and ultimately, disappeared after six months.

7.2 Implications of the study

The findings of this study raise the following implications for CoP practitioners: First, in a group such as a CoP, it is critically important to understand that members' social psychological motivations have a positive influence on knowledge sharing – therefore, the satisfaction of social psychological motivations is essential for the successful functioning of a CoP. For managers intending to introduce CoPs to a firm, it is important that a CoP support environment be created, wherein each CoP member's image, reciprocity, enjoyment of helping, and need for affiliation can be maximized. In particular, intrinsic motivations such as enjoyment of helping and need for affiliation are more critical for knowledge sharing in spontaneous settings such as CoPs. Thus, organizations need to know the status of intrinsic motivation in CoP members, and then determine ways to stimulate those intrinsic motivations.

There is also a clear need for a program to recognize the knowledge contributions of CoP members to strengthen the image motivations of CoP members. This can be accomplished via the selection and public rewarding of regular, high-quality contributor(s) in public at regular intervals, which will affect the attitudes of members toward knowledge sharing. At Siemens, top knowledge contributors are regularly recognized at their annual ''ShareNet'' conference (MacCormack et al., 2002).

In order to satisfy the reciprocity motivator, fairness within the CoP should be encouraged. Fairness is the perception that organizational practices are equitable, and this is a key component of the organizational climate (Bock et al., 2005). When a climate of balanced contribution with no notable discrepancy in contribution levels amongst members can be cultivated reciprocity will positively affect members' attitudes towards knowledge sharing. The creation of an active Q&A corner, titled ''Expert-Net,'' as in the case of Samsung Electronics' semiconductor business unit, may strengthen CoP members' perceived reciprocity (KMRC, 2004a).

Enjoyment of helping behaviors may have a positive effect on CoP members' attitudes toward knowledge sharing. Helping behavior can be encouraged by improving job satisfaction and fostering organizational commitment (William and Anderson, 1991). Therefore, such enjoyment can be enhanced by a variety of programs designed to enhance job satisfaction and organizational commitment. At Samsung Electronics' mobile phone business unit, enjoyment of helping behaviors has been greatly improved by the implementation of the ''Let's Praise One Another'' corner (Jeon and Kim, 2005).

''Need for affiliation'' can be satisfied via a variety of membership training programs. By providing an ''Originating Ba'' (a physical space in which individuals share feelings, emotions and mental models) where CoP members can socialize, dine, play sports, and have relaxed conversations together, the affiliation motivation can be satisfied (Nonaka and Konno, 1998). At Daewoong Pharmaceutical, Korea's number one manufacturer of prescription drugs, CoP members first check into the firm's remote education center and, via a variety of team building activities (such as soccer and all-terrain vehicle racing), form the affiliation identity of each CoP (KMRC, 2004b).

Second, in order to create intentions to share knowledge in CoPs, the organization must support positive recognition of members' capabilities and organizational knowledge sharing norms. It is important that members be confident that they have sufficient abilities and resources to conduct CoP activities by linking them to human resource management programs within the firm and by providing operational autonomy regarding those activities.

Third, as the strengths of relationships between individual motivating factors and CoP members' attitudes toward knowledge sharing differed depending upon the types of CoP (formal vs informal), firms must place an increased focus on extrinsic motivations for formal CoPs and intrinsic motivations for informal CoPs.

Finally, it may be necessary to institute an organization-wide CoP support program to facilitate knowledge-sharing behavior. In addition to the time and space requirements for CoP activities, firms must provide the necessary ancillary information systems and personnel (CoP sponsors, consultants), as well as CoP-related promotion/education.

With regard to academic contributions, many books and articles concerning CoP have been largely conceptual (Brown and Duguid, 1991; Lave and Wenger, 1991; Wenger, 1998) or specific case-based (Kodama, 2002; Storck and Hill, 2000). Theory building or validating studies on CoP implementation are rare, and these have generally addressed a special electronic type (Wasko and Faraj, 2005). This study appears to be one of the earliest formal field studies on CoP, and is designed to foster an understanding of the most critical aspect of CoP activities: knowledge sharing.

The second most important academic contribution of this study may be the extension of individual-level knowledge sharing research. Among the most recent research conducted regarding individual knowledge sharing behavior, the study of Bock *et al.* (2005) addresses the attitude motivator-attitude-intention process of knowledge sharing, but does not concern itself with knowledge sharing behaviors. Kankanhalli *et al.* (2005) assess the linkages between knowledge sharing motivators and final knowledge sharing behaviors, but does not cover the intermediate steps/constructs between the two. Thus, this study integrated the three relevant theories (motivation, TPB, Triandis model) to empirically validate the entire process of individual knowledge sharing phenomena from socio-psychological motivators, linking attitudes, intentions, and behaviors.

Finally, this examination of the CoP types (formal, informal) and their moderating effects on the motivator-attitude linkage will encourage more in-depth studies into different types of CoPs functioning in the real world.

8. Conclusion and limitations

This study has identified confirmatory relations by integrating some theoretical models on human behavior designed to clarify the mechanism of knowledge sharing in CoPs. With an understanding of the entire knowledge sharing process (attitude-intention-behavior), companies should establish a spontaneous knowledge sharing culture.

One of the major findings of this study was that both extrinsic motivational and intrinsic motivational factors can affect attitudes toward knowledge sharing behaviors. In particular, intrinsic motivational factors were determined to exert more profound effect on these attitudes than extrinsic motivational factors. Additionally, some significant differences in knowledge sharing mechanisms between formally-managed and informally-nurtured CoPs were identified.

Of course, the study findings are in some regards limited. First, because the survey samples were limited to Korean high-tech companies, the results of this study may not be generalizable to other countries. For example, the research assumed that in the Korean context, social image or ''face'' has an impact on knowledge sharing. However, this assumption was not tested in other cultures such as Western ones.

Second, a common method variance (CMV) problem might be a relevant issue, as the survey asked the same respondents about both independent and dependent variables. If knowledge-sharing behavior as a dependent variable can be measured via objective measurements (e.g. online CoP log data), such problems may be ameliorated to a substantial degree.

Third, as this study focused on the impact of social motivation on knowledge sharing attitudes, it did not include other significant factors such as personal motivational factors (e.g. personal development, learning and growth, contribution to higher purpose) or contributions to the development of practice. More relevant and powerful models for explaining knowledge sharing in CoPs might be achievable with further study.

Finally, because the data in this study were cross-sectional and not longitudinal in nature, some causal relationships could only be inferred, rather than empirically supported. Once the independent variable and the dependent variable are measured over time, this problem may resolve itself.

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Appendix 1

Table AI Definitions of the constructs

Variable	Definition	Items
Image	The degree to which one believes that one's reputation can be increased by knowledge sharing in CoPs	4
Reciprocity	The degree to which one believes that current knowledge sharing may lead to future requests for knowledge being met in CoPs	4
Enjoyment in helping	The degree of one's perception of pleasure obtained from helping others through knowledge sharing in CoPs	4
Need for affiliation	The degree of one's desire for social contact or belongingness with others in CoPs	5
Attitude	The degree of one's positive feelings about knowledge sharing in CoPs	5
Perceived behavioral control	The degree of one's perception of self-efficacy to manage internal and external constraints for knowledge sharing in CoPs	4
Subjective norm	The degree to which one believes that people who bear pressure on one's actions expect one to perform the behavior in question multiplied by the degree of one's compliance with each of one's referents	6
Intention	The degree to which one believes that one will engage in knowledge sharing in CoPs	4
Facilitating conditions	The degree to which one believes that the organization supports CoP activities	7
Knowledge sharing	The degree to which one actually shares one's knowledge in CoPs	4

			Statistics	
Construct	Item	Alpha	Mean	SD
Image	1. Sharing my knowledge will improve my image within the CoP	0.854	3.294	0.896
	2. Members who share their knowledge through CoP will have more prestige than those who do not.			
	3. Sharing my knowledge through CoP will improve other members' recognition of me			
	4. When I share my knowledge through CoP, other members will respect me.			
Reciprocity	1. When I share my knowledge through CoP, I believe that I will receive an answer for providing an answer	0.886	3.383	0.829
	2. When I share my knowledge through CoP, I expect other members will help me when I'm in need			
	3. When I share my knowledge through CoP, I expect to get back knowledge when I need it			
	4. When I share my knowledge through CoP, I believe that my questioning will be answered in the future			
Enjoyment in helping	1. I enjoy sharing my knowledge with others through CoP	0.934	3.261	0.772
	2. I enjoy helping other members by sharing my knowledge through CoP			
	3. It feels good to help other members by sharing my knowledge through CoP			
	4. Sharing my knowledge with others through CoP gives me pleasure			
Need for affiliation	1. I think being close to other CoP members, listening to them, and relating to them on a one-to-one level is one of my favorite and most satisfying pastimes	0.895	3.362	0.814
	2. Just being around other CoP members and finding out about them is one of the most interesting things I can think of doing			
	3. I feel like I have really accomplished something valuable when I am able to get close to other CoP members			
	4. One of the most enjoyable things I can think of that I like to do is just watching other CoP members and finding out what they are like			
	5. I would find it very satisfying to be able to form new friendships with other CoP members I liked			
Attitude	1. My knowledge sharing with other CoP members is good.	0.908	3.847	0.540
	2. My knowledge sharing with other CoP members is harmful			
	3. My knowledge sharing with other CoP members is an enjoyable experience			
	4. My knowledge sharing with other CoP members is valuable to me			
	5. My knowledge sharing with other CoP members is a wise move			
Perceived behavioral control	1. I have the ability to control knowledge sharing in the CoP	0.902	3.229	0.782
	2. I have the resources necessary to share knowledge in the CoP.			
	3. I have the knowledge necessary to use the system.			
	4. Given the resources, opportunities and knowledge, it would be easy for me to share knowledge in the CoP			
Subjective norm	*Normative beliefs on knowledge sharing*	0.881	0.0	1.0
	1. My CEO thinks that I should share my knowledge with other members in my CoP			
	2. My immediate supervisor thinks that I should share my knowledge with other members in my CoP			
	3. My team co-workers think that I should share my knowledge with other members in my CoP			
	4. My CoP leaders think that I should share my knowledge with other members in my CoP			
	5. My CoP seniors think that I should share my knowledge with other members in my CoP			
	6. My CoP colleagues think that I should share my knowledge with other members in my CoP			
	Motivation to comply			
	1. Generally speaking, I would do what my CEO thinks I should do			
	2. Generally speaking, I would do what my immediate supervisor thinks I should do			
	3. Generally speaking, I would do what my team co-workers think I should do			
	4. Generally speaking, I would do what CoP leaders think I should do			
	5. Generally speaking, I would do what CoP seniors think I should do			
	6. Generally speaking, I would do what CoP colleagues think I should do			

Table AII Questionnaire items

(*Continued*)

Table AII

Construct	Item		Alpha	Statistics Mean	SD
Intention	1.	I will share the work reports and official documents obtained from inside the organization with other CoP members	0.903	3.908	0.679
	2.	I will share the work reports and official documents obtained outside the organization with other CoP members			
	3.	I will share my experience or know-how from work with other CoP members			
	4.	I will share my expertise from my education or training with CoP members			
Facilitating conditions	1.	Specialized instruction, concerning knowledge sharing in the CoP, is available to me	0.885	2.892	0.897
	2.	Activities, promoting knowledge sharing in the CoP, are available to me			
	3.	Specialized consulting persons (or group) are available for assistance with my knowledge sharing in the CoP			
	4.	Use of Information systems are very supportive of my knowledge sharing in CoP			
	5.	Sponsors are very supportive for my knowledge sharing in my CoP			
	6.	Time is available for CoP activities			
	7.	Space is available for CoP activities			
Knowledge-sharing behavior	1.	I frequently share the work reports and official documents obtained from inside the organization with other CoP members	0.881	3.224	0.913
	2.	I frequently share the work reports and official documents obtained outside the organization with other CoP members			
	3.	I frequently share my experience or know-how from work with other CoP members			
	4.	I frequently share my expertise from my education or training with CoP			

Note: Alpha indicates composite reliability, SD indicates standard deviation

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