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THE EFFECT OF SOCIAL COHESION ON KNOWLEDGE-SHARING IN SCIENCE CITIES: AN EMPERICAL STUDY IN CYBERJAYA, MALAYSIA

[1]OLORUNTOBA KAYODE [2]ONI OLUWASHOLA FEYISARA [3]AYODELE SAMUEL KOLAWOLE

[1]Department of Architectural Technology, Federal Polytechnic, Ile Oluji. Ondo State, Nigeria

[2]Department of Architectural Technology, Rufus Giwa Polytechnic, Owo, Ondo state, Nigeria

[3]Department of Library science, Rufus Giwa Polytechnic, Owo, Ondo state, Nigeria

kayodetoba@yahoo.com

Abstract

Science cities center on achieving knowledge-based development through effective knowledge-sharing, but literature consistently relates human social cohesion with sharing and knowledge-management. This study fills this gap in the literature. It explores whether group social cohesion develops knowledge-sharing in Cyberjaya (Science City) Malaysia. Questionnaires were administered to residents in the study area concerning the potential of social cohesion to engender knowledge-sharing. A research model was validated using structural equation modeling (SEM). Our findings shown that human social cohesion influences knowledge-sharing, exhibiting higher influence on human attitudes toward sharing among knowledge-sharing factors.

Keywords: Science cities; knowledge-based development; knowledge-sharing; social cohesion.

Introduction

The significance of knowledge-based development in the context of knowledge-sharing evolved technological cities and intelligent societies into science cities (Carrillo, 2004; Ovalle*et al.*, 2004; Yigitcanlar and Martinez-Fernandez, 2007; Itumeleng M, et al., 2018; Yassmin D, 2021). Therefore, the advent of industrial economy to the knowledge-based economy as operationalized in science cites has made the industries to applied knowledge in achieving a better product in quicker way (Drucker, 1993). As such, science city (technological city) has solely depended on knowledge as tool for techno development. Knowledge can be view as an experience and skill acquired in span of time (Allee, 1997) and the potentials to act (Sveiby, 1997). Knowledge sharing occur when individual choose to transfer and shared his know-how and know where with others within a designated organisation / urban setting (Ryu et al., 2003; Yassmin D, 2021). It's an offshoot of information flow that is being put into action (O' Dell and Grayson, (1998); Nonaka and Takeuchi, 1995).

Numerous researchers emphasize the significance of knowledge-sharing and innovative organizational development in science cities (Kaser and Miles, 2002; Bock *et al.*, 2005; Alavi and Leidner, 2001; Harbi *et al.*, 2011), and it is clear that high-tech firms must develop knowledge to boost productivity (Chove and Anderson, 2006). Gold et al. (2001) averts that knowledge sharing is an important assert towards organization drive to attained sustainable and national competitive advantage. Knowledge is not having unilateral meaning as information. Information can be considered as a flow of message knowledge is the extraction from it (Ling et al., 2009). These authors emphasized that knowledge is hinged on the reliability and trust exhibited by individual. However, knowledge ascertains and modifies information's for effective productivity (Alavi and Liedner, 2001). It's a state of mind that having links to relevant information (Wasco and Faraj, 2000).

To achieve a desirable knowledge sharing among people, the knowledge sharing institutions needed to put in place necessary supportive resources that can boost sharing culture among people. Knowledge sharing consists of exchange of employee valuable know-how, ideas and experience among others. It can be defined as human social bond and interaction that encompass exchange of employee skill and experiences for effective development. The evolution of science city emerged in the United States in the 1950s when Stanford University merged with industrial sectors for innovation purposes. Thus, Cyberjaya Malaysia is sharing similar innovation orientation as a multimedia super-corridor for knowledge-based development (Setia HarumanSdn. Bhd, 2007).

Influence Of Knowledge Sharing on Team Performance

The performance of an organization has been posited to hinge on knowledge sharing (Haung, 2009; Xia and Shao, 2012; Yuqin et al., 2012; Yassmin D, 2021; Itumeleng M, et al., 2018). The author argue that the research and development organizations (R&D) possess the advantage of quality competitive performance as a result of the ability to bring experts from different discipline and encourage knowledge sharing culture and environment. Previous research has argue that the successfulness of R&D can be achieved through knowledge sharing (Cumming, 2004; Galleta et al., 2002). The diversity in the composition of R&D professionals make possible for varies experience and knowledge exchange thereby creating knowledge sharing. When there is no knowledge sharing in an organization, employee began to continually experiencing similar problem that should have been solving with little discussion, sharing of expertise and experiences. Thus, experience-based skills solve recent challenges (Zhuge et al., 1997). Team can perform better when there's interchange of ideas and hence, refined individual methods and knowledge to develop their direction of solving problems in the working place. Lack of knowledge resulted into poor performance (Nelson and Coopridor, 1996; Lee et al., 2005). Consisted with these authors' assertions, existing literature has put forward that there is a good relationship between knowledge shared among group member and their performance (Shaw, 1981; Stasser et al., 1995).

A study conducted on information sharing and group performance among team of 38 groups of students reflects the information sharing has the tendency to reduced relationship and task conflicts in an organization (Moye and Langfred, 2005). Better organizational performance requires better knowledge sharing. More so, the study conducted by Lee and Chen (2007) on a new product improvement team indicated that group knowledge sharing is strongly associated with performance while McAdam et al. (2008) advocated for the need of knowledge and information sharing towards organizational effective production. At institutional level, Numprasertchai and Igel (2005) suggested that researchers in the higher institution of learning can improve their skill faster and better through knowledge sharing. A cross interchange of experience and skill develop a dynamic knowledge output. Expert, importantly the production engineers can refine their skills to address challenges in their workplace through sharing of their knowledge. Expert collaboration improve team performance (Aderson and Drejer, 2009; Michailova and Minbaeva, 2013).

Nonaka and Takeuchi (1995) argue the best approach for organizations to gain knowledge is through sharing; individual knowledge is not sufficient to support firm innovation. Knowledge-sharing is vital for innovative progressiveness, adding value to organizational performance (Patrick and Dotsika, 2007) and providing opportunities for competitive advantages (Lin, 2007). Nonaka and Konno (1998) introduce the concept of *ba*, shared space for human interaction geared toward knowledge. The author's stress tacit knowledge resides in *ba* and is attainable in interaction processes. However, in a study of Taiwanese technology firms, Liu and Liu (2008) suggest knowledge is acquired primarily by developing strong cohesion among groups. Knowledge is not merely information; it is interaction among groups with expectations of innovative output (Hong *et al.*, 2011), which is organizational intellectual capital. The authors argue tacit knowledge can be generated and transferred in the context of human social interactions at both organizational and individuals levels. Ling *et al.* (2009) suggest knowledge is not simply possessing unilateral meaning.

The Aspect of Tacit Knowledge

In the early research work on knowledge, Knowledge was solely considered as object that can be transfer and retrieved or stored. But this concept resulted into unproductive outcome as it requires that not all knowledge are explicit, then human cognitive area of social interpersonal idea exchange was receiving research interest. The social cognitive concept classified knowledge as a product derived within social system (Beer and Ochsner, 2006; Nonaka and Konno, 1998). Therefore, there arises the consideration of tacit dimension of knowledge that is socially embedded in individual and group member through interaction. This implies that knowledge can be obtained by interaction and not by impose tool and structures. It's much about creating knowledge and not just by transferring (Hooff and Huysman, 2009).

Explicit knowledge is acquired through scientific analytical reasoning. It's highly individualized and foothold in western philosophy of Descartes (Cook and Brown, 1999). It's attained able from the process of formal training. These encompass the nature of knowledge acquired through various skill training, professional workshop and conferences. This type of knowledge can be transferred to people faster and be extended to larger number of trainees. Tacit knowledge is fully an action oriented that reside in doing and learning and not from analytical thinking. It's acquired from an interaction between groups of people having social bond that capable of trigger interaction or discussion on specific context of interest. Tacit knowledge is difficult to be codified or store but explicit knowledge can be store in electronic device or on manual basis (Bock et al, 2005). Its foothold on people readiness and social commitment among neighbours couple with the conduciveness of the environment (Cook and Brown, 1999). Tacit knowledge is described as informal and subjective (Nanaka, 1991). Yang and Farn (2009), and Ling et al. (2009) argued that explicit knowledge has lesser productivity value. Importantly, most school of thoughts such as organisation and leaning institutions have continuously appreciating the tacit knowledge in preference to the explicit knowledge as better means of gaining competitive knowledge (Nonake and Takeuchi, 1995). The knowledge required in the innovation and organizational productivity and firm performance is rooted in tacit knowledge (Bock et al., 2005; Zhi-guo and Cui-Jian, 2012). Therefore, tacit knowledge can be easily achieved by individual primarily in a tacit oriented dimension that embraces social interaction and group cohesiveness (Choi and Lee, 2003).

Ling *et al.* (2009) avert that tacit knowledge is a major component of organizational productivity development that is hinges on trust and reliability exhibited by individuals. Hence, acquisition of tacit knowledge is embodied in both group social cohesion (Ahuja, 2000; Huang, 2009) and knowledge-sharing through social interactions capable of producing technological results (Patrick and Dotsika, 2007). Social cohesion encompasses interpersonal trust and it is the social bonds that exist among individuals and groups (Tolsma *et al.*, 2009; Itumeleng M et al., 2018). It encourage a sense of trust by contributing to a group's collective goals and exchanges (Chang and Chuang, 2011; Kearns and Forrest, 2000).

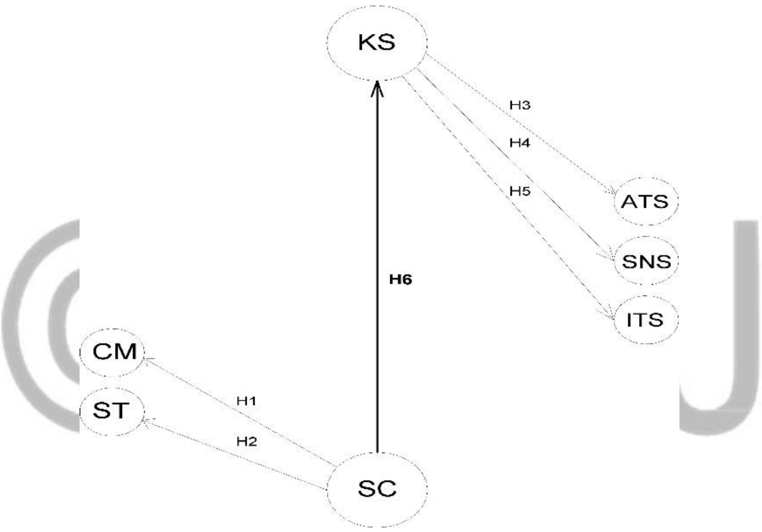
Influence of Trust on Knowledge Sharing

Trust can be view as psychological construct, the outcome of an experience derived from people interaction, emotions and attitude (Huang, 2009; Itumeleng M et al., 2018). Trust requires regular familiarity and interaction. The willingness to share is highly resided on the degree of trust among people (Isai and Ghoshal, 1998; Yassmin Diab, 2021) while interpersonal trust is a factor in developing an effective knowledge sharing (Huang, 2009). Therefore, trust is related to sharing of knowledge among team of professional. Renzl (2008) opined that the level of knowledge sharing can be improve through trust as a facilitating tools while the knowledge sharing quality is associated with degree of trust (Chiu et al., 2006). Trust is embedded in human social cohesion. When group or individual acquire trust, it influence their level of knowledge transferring (Wang and Yang, 2008). Therefore, group cohesiveness is needed to obtain sharing potentials. Alliance literature characterizes social cohesiveness as a trigger for knowledge-sharing and social cohesiveness is a valuable component of knowledge that resides in tacit knowledge (Buckman, 2004; Mooradian, 2005; Smith, 2001). Unfortunately, the literature does not pay enough attention to social cohesion in the context of research and development (R&D) teams (Huang, 2009; Podsakoff *et al.*, 1997). As part of an on-going research program concerning science cities' knowledge-sharing development, this study investigates social cohesion's ability to foster knowledge-sharing.

Study Area

The name Cyberjaya was coined from two words, namely “Cyber” and “Jaya”. Cyber is an English word that associated with internet-technology, and computer. Jaya is Malay word that associated with success and breakthrough. The science city planned to prepare solid ground for businesses and organisations that paraded the modern Information and Communications Technology (ICT). It was designed to provide an architectural and nature appealing physical environment that capable of attracting human attention both at local and international towards innovation and knowledge-based development goal. (Mahathir, 1998; Yusof, 2010). The city consists majorly the industrial, educationist and commercial experts having an interchanged of ideas that foothold in group cohesiveness toward knowledge sharing.

Figure 1. Confirmatory analysis model and hypotheses



Note: SC=Social cohesion, CM=Collective mind, SNS=Subjective norms to share knowledge, ATS=Attitude to share knowledge, ST=Social ties, ITS=Intention to share knowledge, KS=Knowledge-sharing.

.Analysis of model and hypotheses

Figure 1 illustrates a model of the influence of cohesiveness on knowledge-sharing. Sharing know-how and know-where represents knowledge-sharing among groups (Hong *et al.*, 2011; Lin, 2007), but idea and information-sharing requires familiarity that facilitates social ties and collective meaning that develop through frequent social interactions (Chow and Chan, 2008). Weick and Roberts’ (1993) theory refers to collective meaning arising from human activities that develop a collective mind, while social ties are interpersonal manifestations of human cohesiveness embedded in social interactions.

Table 1. Measuring variables and indicators for social cohesion

	Social ties
1	I do involve in social activities with others in this science
2	Members of this science city do engaged in working or doing things together
3	I do meet with other neighbors in this science city
4	I do interact with others in this science city
	Collective mind
1	My teams members have a global perspective that include search other's decisions and the relationship among them.
2	My team members carefully interrelate actions to each other on the R&D
3	My team members carefully make their decisions to maximize an overall team performance.
4	My team members have developed a clear understanding of how each R&D activity should be coordinated

Table 2. Measuring variables and indicators for knowledge sharing

	Attitudes to share knowledge
1	Sharing of my knowledge with people that I am used to is always good
2	Sharing of my knowledge with organizational members is always helpful
3	Sharing of my knowledge with organizational members is always an enjoyable experience
4	Sharing of my knowledge with organizational members and others is always cherished by me
5	Sharing of my knowledge with organizational members and others is always a wise move
	Subjective norms to share knowledge
1	Your Chief Executive Officer (CEO)/Management should always think that you should share your knowledge with other members in the organization
2	Your boss should always think that you should share your knowledge with other members in the organization
3	Your colleagues should always support that you should share your knowledge with other members in the organization
	Intention to share knowledge

1	I will share my work reports and official documents with my organization members and others more frequently in the future.
2	I will always share my manuals, methodologies and models with my organization members in the future.
3	I will always share my experience or know-how from work with my organization members in the future.
4	I will always share my know-where or know-whom at the request of my organization members.
5	I will always try to share my expertise obtained from education and training with my organization members in a more effective way.

Social ties are essential factors when predicting knowledge (Hansen *et al.*, 1999; Uzzi and Lancaster, 2003) and group social relationships toward shared goals as a product of a collective mind that influences knowledge-sharing (Van Wijk *et al.*, 2008). Huang (2009) argues social cohesiveness is determined by group social ties and a collective mind, while knowledge-sharing predicts people's attitudes toward sharing knowledge, subjective norms to share knowledge, and intention to share knowledge (Chow and Chan, 2008; Requena, 2003). Hence, group social ties and collective mind influence knowledge-sharing.

Attitude toward sharing reflects exchanging knowledge and information arising from individual desires to share, while subjective norms to share represent an influence by community members and others to share (Chow and Chan, 2008; Requena, 2003). Collective attitude to share constitutes subjective norms to share, which contributes to intention to share (Chow and Chan, 2008; Requena, 2003). Thus, Social cohesion is a relationship among people embedded in a social system, characterized by social bonds and trust. Group bonds trigger goal-sharing resulting from the collective mind exhibited by individuals, and collective mind denotes harmonious group relationships (Akgun *et al.*, 2007) that have the potential of developing sharing of know-how with others. Therefore:

H1. Collective mind influences Social Cohesion

H2. Social ties influence Social Cohesion.

There is no single definition of knowledge (Suppiah and Sandhu, 2011); knowledge is embedded in individual cognitive views and reasoning, an essential resource gaining much attention in research based on non-quantifiable elements (Davenport and Prusak, 1998; Suppiah and Sandhu, 2011; Yi, 2009). Knowledge can be explicit or tacit (Mooradian, 2005), and is achieved through experience, information, and theory. Social networks provide the paths necessary to acquire information (Chang and Chuang, 2011). Based on social cognition theory, Bruner (1996) suggests knowledge refers to sharing within a designated circle. Hence, knowledge-sharing is a product of effective group social cohesion, requiring both positive attitudes to share within a social system and subjective norms that govern sharing expectations (Bock and Kim, 2002).This factor depends on long-term traditions of immediate community members and teams. It is social influence to perform or not perform a behavior or action (Kuo and Young, 2008), while attitude reflects individual willingness to perform an action or behavior. Attitude clearly influences knowledge-sharing (Yang, 2008). The Theory of Reasoning Action (TRA) suggests attitudes and subjective norms determine intention to perform an action (Fishbein and Ajzen, 1975). Therefore:

H3. Knowledge-sharing correlates positively with attitude toward sharing knowledge.
H4. Knowledge-sharing correlates positively with subjective norms to share knowledge.
H5. Knowledge-sharing correlates positively with intention to share knowledge.

Group cohesiveness is the basis for strong bonds and social ties that encourage information and idea exchanges (Chang *et al*, 2006). Sharing behaviorsare associated with cohesive groups. However, people share knowledge with those with whom they are familiar and sharebonds (Van Wijk *et al*., 2008), implying knowledge-sharing relates to social cohesion. Therefore:

H6. Group social cohesion correlates positively with knowledge-sharing.

Research Methods

Figures 1 depict the research models with which we examine public green areas and the effects of utilization tendencies on group social cohesiveness. One-hundred ten questionnaires were administered to users of Cyberjaya public areas. Various public areas were visited during weekdays and weekends in mornings, evenings, and at night. We developed the questionnaire by adopting measures validated in extant studies and modifying them to fit the context of this study. Indicators for the constructs were measured using a five-point, Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Social cohesion was measured using two items: social ties and collective mind. The social ties construct was adopted from Chiu *et al.* (2006) and Huang (2009), and collective mind from Yoo and Kanawattanachai (2001) and Huang (2009). Knowledge-sharing was measured using three items (attitude to share knowledge, subjective norms to share knowledge, and intention to share knowledge), adopted from Hutchings and Michailova (2004), Requena (2003), and Chow and Chan (2008).

Demographical Survey

Demographics such as age, gender, education, work status, duration of residence, public area use, and types of public areas visited were used to investigate influences on variables appearing in Table 1. High numbers of respondents (52.7%) were science city residents and indicated high interest in public area visitation. The majority of Cyberjaya public area users exhibited high levels of literacy since 62.7% and 2.7% were holders of university (or equivalents)or postgraduate degrees, respectively.

Table 3. Respondent profiles (n=211)

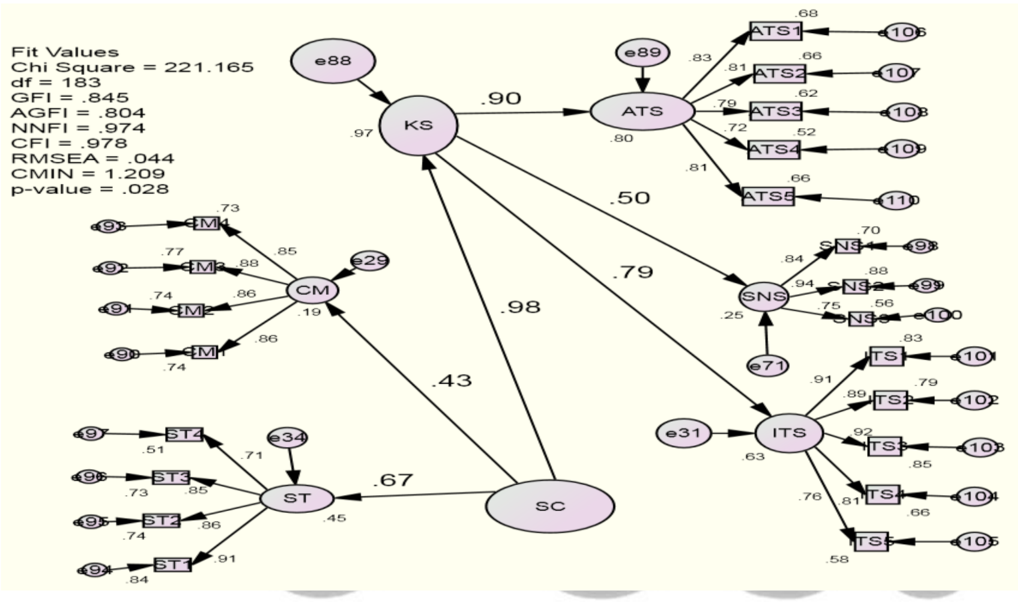
Measure	Items	Frequency	Percent (%)
Gender	Male	132	62.6
	Female	79	37.4
Resident Status	Yes	154	73
	No	57	27
Educational Status	High school/below	4	1.9
	Undergraduate	29	13.7
	University Degree/equivalent	136	64.5
	Postgraduate degree	42	19.9
Types of Public Spaces Visited	Neighborhoods courtyard/communal spaces		
	Public square/ Urban clusters	119	56.4
	Public Parks	43	20.4
	Others (bus/stop, canopy, etc.)	27	12.8
		22	10.4

Analyses and Results

We used the survey method for data collection and examined hypotheses using structural equation modeling (SEM). Use of SEM was based on the method's ability to assess relationships among variables with multiple indicators (Joreskog and Sorborn, 1996). AMOS was applied to present details and graphical presentations of findings. Construct indicators were tested for reliability and validity before analyzing the structural model.

For hypotheses 1 through 6, measurement constructs and their indicators were examined for convergent and discriminant validities. Shown in Table 4, convergent validity was measured using composite reliabilities and average variances extracted (AVE) (Fornell and Larcker, 1981). Composite reliabilities ranged from 0.881 to 0.933, signifying reliable values above the benchmark of 0.7 (Nunnally and Bernstein, 1994).AVEs ranged from 0.612 to 0.869, above the benchmark of 0.5 (Bagozzi and Yi, 1988) and indicating adequate convergent validity. Confirmatory factor analysis (CFA) was used to test the entire measurement model as recommended by Anderson and Gerbing (1992). Factor loadings for all indicators were significant at 0.001, indicating good loadings as recommended by Bagozzi and Yi (1988). Figure 2 presents structural model output reflecting fit as follows: normed χ^2 for the measurement model was 1.340 (χ^2/df =1.340;df =182). Normed values less than 2 suggest acceptable reliability (Bagozzi and Yi, 1988).

Figure 2. Results of the confirmatory analysis model



Note: SC=Social cohesion, CM=Collective mind, SNS=Subjective norms to share knowledge, ATS=Attitude to share knowledge, ST=Social ties, ITS=Intention to share knowledge, KS=Knowledge-sharing.

The adjusted goodness of fit index (AGFI) was 0.788 which is approximately 0.8 of the marginal value (Bagozzi and Yi, 1988). The goodness of fit index (GFI) was 0.833 which above the 0.8 marginal value recommended by Chau and Hu (2001) and Bagozzi and Yi (1988). The comparative fit index (CFI) was 0.964, and the NNFI was 0.958, both exceeding the 0.9 minimum value recommended by Browne and Cudeck (1993). The root mean square error of approximation (RMSEA) was 0.056, below the maximum value of 0.08 recommended by Browne and Cudeck (1993). Considering these results (Figure 2), the model addressed the research hypotheses since the measurement model suggested good fit.

In Figure 2 and Table 4, path loadings of approximately 0.2 or above are significant as recommended by Cohen (1988; 1992a; 1992b). This result demonstrates reliable path loadings since most of the measurement items of social ties (ST) exhibited path loadings on intention to share knowledge (ITS), subjective norms to share knowledge (SNS), and attitude to share knowledge (ATS), respectively.

Table 4. Measurement variance analyses and reliabilies

Constructs and Indicators	Estimates	T-values	Cronbach'sAlphas	Average Variances Extracted	Composite Reliabilities
Social ties			0.900	0.869	0.919
ST1	.920				
ST2	.855	12.692			
ST3	.850	12.548			
ST4	.716	9.203			
Collective mind			0.919	0.743	0.920
CM1	.859				
CM2	.857	11.433			
CM3	.880	11.940			
CM4	.851	11.291			
Attitude to share			0.893	0.612	0.887
ATS1	.817				
ATS2	.803	9.395			
ATS3	.776	8.977			
ATS4	.707	7.951			
ATS5	.803	9.396			
Intention to share			0.935	0.736	0.933
ITS1	.908				
ITS2	.886	14.242			
ITS3	.921	15.697			
ITS4	.808	11.635			
ITS5	.755	10.238			
Subjective norms to share SNS1	.841		0.881	0.714	0.881
SNS2	.936	11.015			
SNS3	.748	8.937			

Note: SC=Social cohesion, CM=Collective mind, SNS=Subjective norms to share knowledge, ATS=Attitude to share knowledge, ST=Social ties, ITS=Intention to share knowledge, KS=Knowledge-sharing.

Table 5. Summary results of the structural model

Hypotheses	Hypothesized Paths	Path Coefficients	Results
H1	Collective mind influences social cohesion.	0.43	Supported
H2	Social ties influence social cohesion	0.67	Supported
H3	Attitude toward sharing knowledge influences knowledge sharing	.90	Supported
H4	Subjective norms to share knowledge influences knowledge sharing.	0.50	Supported

H5	Intention to share knowledge influences knowledge sharing.	0.79	Supported
H6	Social cohesion influences knowledge sharing.	0.98	Supported

Discussion

This study's findings present the effects of social cohesion on knowledge-sharing development. Social ties possess strong potential to influence changes to all constructs related to knowledge-sharing, implying social cohesion exhibited by residents of Cyberjaya, Malaysia determines the extent to which subjects share knowledge. Although collective mind influenced attitude to share knowledge, it affected neither subjective norms to share knowledge nor intention to share knowledge. Interestingly, attitude to share knowledge, which had significant path loadings to social ties and collective mind, influenced both intentions to share knowledge and subjective norms to share knowledge. This suggests the effects of attitude to share knowledge on both intention to share knowledge and subjective norms to share knowledge overturns the negative influence of collective mind on the same two variables.

Knowledge-sharing had strong loadings on intention to share knowledge, subjective norms to share knowledge, and attitude to share knowledge. This corroborates studies by Requena (2003) and Chow and Chan (2008), which suggest knowledge-sharing is a product of these endogenous variables. Knowledge-sharing can be measured using attitude toward sharing knowledge, subjective norms to share knowledge, and intention to share knowledge. Social ties exhibited strong paths to collective mind. Importantly, social ties and collective mind both exhibits strong loading on knowledge sharing. Consistent with Huang (2009) and Chiu *et al.* (2006), who argue collective mind and social ties are good predictors of social cohesion, the statistical significant paths loading of social ties and collective mind on knowledge sharing further signifying a strong influence of social cohesion on knowledge-sharing.

Conclusion, Limitations, and Future Research

In a science city context, both knowledge acquisition and sharing are major factors (among others) required to achieve knowledge-based development. More research is needed to investigate and develop means to engender knowledge-sharing among various actors and residents in a science city. This study provides an empirical survey to examine the effects of social cohesion on knowledge-sharing in that context, and findings confirm knowledge-sharing develops through social cohesion.

The degree to which knowledge-community dwellers and groups of individuals embrace social cohesiveness determines knowledge-sharing potential. To attain significant knowledge-based development in science cities, experts in academic, commercial, and industrial settings should engage in social activities and interactions to trigger social cohesion as a means of acquiring knowledge for technological and national development. This study focuses on social cohesiveness 'influence on knowledge-sharing as it relates to a current research program in an environmental discipline, which demands a study to validate social cohesion's influence on knowledge-sharing in the science city of Cyberjaya. Future research should consider a wider scope of developing knowledge-sharing in relation to group cohesiveness.

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