

Online knowledge sharing mechanisms: a systematic review of the state of the art literature and recommendations for future research

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Abstract Knowledge sharing is an activity through which knowledge, namely, information, skills, or expertise, is exchanged between people, friends, families, communities or organizations. Online knowledge sharing activities are flourishing with the advent of social media and digital life. However, despite of the importance of the online knowledge sharing methods and mechanisms, there is not any comprehensive and systematic study about studying and analyzing its important techniques. Therefore, the main aim of this paper, the comprehensive, detailed, and systematic study, and survey of the state-of-the-art knowledge sharing mechanisms in an online environments is provided. Also, this paper presents a systematic literature review (SLR) on the online knowledge sharing literatures up to end of 2015. We identified 348 papers, which are reduced to 251 primary studies through our paper selection process. Also, the broad overview of the literature provides insights into potential areas for further research. By providing state-of-the-art information, this survey will directly support academics and practicing professionals in their understanding of developments in online knowledge sharing mechanisms and techniques.

Keywords Knowledge sharing · Online knowledge sharing · Online environment

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1 Introduction

Human society, physical world, digital life and information space can be fully connected and integrated with the help of various technologies specially information technology (Jafari Navimipour et al. 2014; Li et al. 2013). In this era, knowledge sharing can enable organizations to leverage their most valuable asset of sharing their employees' knowledge with others. Therefore, the ability to effectively share knowledge is critical for any organization (Majchrzak et al. 2013). Knowledge sharing is defined as activities involved in disseminating or transferring knowledge among individuals, groups or organizations (Lee 2001; Tong et al. 2015), where individuals exchange their tacit and explicit knowledge and create new knowledge (Tong et al. 2015; van den Hooff and De Ridder 2004). Also, computer-mediated communication research shows that communication patterns play an important role in the collaborative efforts of online knowledge sharing activities. Existing research is mainly focused on either user communication patterns at the community level or self-centered positions in communication networks (Wang et al. 2014b). Nowadays, online knowledge sharing activities are flourishing with the advent of social media and its popularity. A variety of factors associated with knowledge sharing in online environments have also been identified in prior literature, including individual cognition (e.g., status, reputation, reciprocity and enjoyment), interpersonal interaction (e.g., social interaction and trust), and organizational context (e.g., organizational support and reward systems) (Cheung et al. 2013). Within an online community, individuals with common interests, backgrounds, and goals can share knowledge by posting questions, providing answers, and debating issues based on shared interests, using social media such as online discussion forums, e-mail list servers, blogs, electronic bulletin boards, and wikis (Chai et al. 2011; Cheung et al. 2013;

Yang and Lai 2011). So, knowledge sharing or knowledge contribution in online communities is increasingly acknowledged as an important research topic (Cheung et al. 2013; Choi et al. 2010; Lin et al. 2009a).

However, without employing an effective knowledge sharing method, organizations might not integrate experts' critical knowledge, skills and abilities to accomplish the complex and innovation work (Breu and Hemingway 2004; Zhang et al. 2013). A key challenge that managers and administrators face today is how knowledge sharing can be achieved efficiently and effectively in the changing form of the organizations to online social network communities (Tian 2011). Also, Quinn et al. (1998) have supposed that the knowledge sharing is not only the biggest challenge and problem in knowledge management, but also the most important factor in measuring the performance of the knowledge management or organizational learning. As an example, language differences is an important challenge in international collaborations as the demand for both literal and conceptual translation which adds difficulty, complexity, and opportunity for wrongdoing (Duan et al. 2006; Eglene and Dawes 2006). From the developing country side, barriers such as insufficient legal frameworks, ineffective enforcement, and frequent changes in the legal infrastructure are all possible challenges (Dawes et al. 2012). To achieve collaborative advantages, the providers need to expose proprietary information and share valuable knowledge in the collaborative processes, but these processes offer opportunities for the partner to misappropriate the knowledge it has. This challenge is especially severe when the providers are also contenders (Ho and Ganesan 2013). Furthermore, knowledge transfer requires disseminating knowledge effectively; but transferring knowledge across national borders is a challenge (Hsiao 2008).

In the last decade, by facilitating the information and data transferring using Internet and web services as an information hub (Navimipour and Milani 2014; Navimipour et al. 2015; Navimipour and Zareie 2015; Oussalah et al. 2014), the online environment and communities played an important role in societies and human life. Also, the impact of knowledge sharing in the online environment makes the information transferred quickly among people. As another hand, employees who need the training do not have to gather in a place at the same time, and thus it is not necessary for them to travel far away for attending training courses (Navimipour et al. 2015; Navimipour and Zareie 2015). However, despite of the important role of online knowledge sharing in attaining a competitive advantage of organizations, we did not find any comprehensive study about analyzing it. So, in this paper, we examine the online knowledge sharing papers and collected a summary of results. Also, we offer solutions for the future studies. Therefore, this paper aims

to survey and analyze existing techniques systematically, and to delineate the types of addressing challenges. Finally, it presents the guidelines to face the existing challenges. Briefly, the main contributions of this paper are as follows:

- Offering the systematic and analytic overview on the online knowledge sharing articles;
- Offering a summary as well as advantageous and disadvantageous of the selected articles;
- Exploring some primary challenges in the field is of the online knowledge sharing and presenting the guidelines to face the existing challenges;
- Outlining the key areas where future research can improve the function of online knowledge sharing.

The rest of this paper is structured as follows. Section 2 classifies of the articles systematically. Section 3 discusses selected online knowledge sharing mechanisms and categorizes them. Section 4 provides the results, taxonomy, and comparison about the discussed mechanisms. Section 5 outlines the open issues and future guidelines. Finally, the paper is concluded in Section 6. Also, Appendix 1 provides the basic concepts and related terminologies; Appendix 2 provides the abbreviation of the used terms in the paper; and Appendix 3 provides the publishing information of the reviewed articles in Section 3.

2 Systematic review

A systematic literature review (SLR) is a critical assessment and evaluation of all research studies that address a particular issue. The researchers use an organized method of locating, assembling, and evaluating a body of literature on a particular topic using a set of specific criteria. A systematic review typically includes a description of the findings of the collection of research studies. Previous researchers have argued that using such an approach to review literature can ensure that the systematic error is limited, chance effects are reduced, and the legitimacy of data analysis is enhanced (Buller and McEvoy 2012; Fraj et al. 2015). All of these benefits lead to more reliable results that form the basis for drawing conclusion (Buller and McEvoy 2012; Fraj et al. 2015). An SLR is a research method originating from the field of medicine (Nkomo and Hoobler 2014; Valentine 2010) and studies in the domains of engineering and social science have started to adopt this methodological approach more frequently (Coetzer and Sitlington 2014). In this section, an SLR is used to perform a comprehensive and systematic study of the online knowledge sharing mechanisms. Then, the validity of the study selection procedure was evaluated as described below. In the following subsections, we describe the search process, including the article selection process and classification.

2.1 Article selection process

The article selection strategy is consisted three main stages as follow:

- Stage 1: Automated search based on the keyword “online knowledge sharing”, via an electronic search using online scientific databases.
- Stage 2: Selection based on the title of the papers.
- Stage 3: Selection based on the reputation and validity of the journals.

In stage 1, Google scholar and electronic databases such as ScienceDirect, Springerlink, Web of Science, IEEE are used in the SLR process. For keyword (knowledge sharing online), to find relevant articles. The study was based on articles that were found in the electronic databases depicted in Table 1.

Stage 2 begins by setting certain practical screening criteria. In total, the 348 results are obtained. The working papers, reports, erratum, editorial notes, and commentaries were excluded. Then 251 relevant articles have remained. Finally, the 55 articles were considered for analysis. The papers selected based on their title and the publisher, including Elsevier, Springer, Emerald, IEEE, Sage, Taylor, Wily, AISel, ACM.DL, ERIC, Citeseer and etc. Indeed, publications that cover the topic of online knowledge sharing may not always be published in highly ranked journals because it is still an emerging topic.

In last stage, the authors separately read the full text of the articles’ titles and abstracts to assess for their relevance. Based on the article relevance, publication years, and journal rank, this time-consuming process resulted in excluding 97 articles that did not meet the inclusion criteria. The 251 article have remained related to the topic. So, the 55 articles were considered for further analysis that detail as a final analysis of the content that is provided in section 3.

An overview of the used process for articles selection is illustrated in Fig. 1. The Google scholar search engine and electronic databases were used to find the primary studies with automated search. This search resulted in identifying 348 articles considered relevant. The citation information, abstracts, and keywords of all articles were exported to an Excel spreadsheet for further analysis. Then, we automatically search

keywords and then found 251 articles from the journals and conferences, and 97 articles were written in non-English language and citation, so were excluded, because they were not readable for authors. In addition, Table 2 shows the selection funnel in terms of the number of articles after each stage in each category. The articles resulting from the initial search were divided into three parts, including 197 journals, 44 conferences, and 10 books. The 106 article from 251 articles was on 11 famous publishers such as Elsevier, Springer, Emerald, IEEE, Sage, Taylor, Wiley, AISel, ACM.DL, ERIC, Citeseer, and 145 articles has been published in the other journals.

2.2 Articles classification

The distribution and classification of the online knowledge sharing articles are described in this section. Table 3 dealt with knowledge sharing in an online environment by 245 articles. The distribution of the articles by year of publication is shown in Fig. 2. It shows that publications which are related to knowledge sharing in an online environment up to 2015. In 2012, the amount of published articles is the highest. In addition, Fig. 3 shows the distribution of the articles over time in each investigated categories including Elsevier, Springer, Emerald, IEEE, Sage, Taylor, Wily, AISel, ACM.DL, ERIC, Citeseer and etc. Fig. 4 shows the distribution of the articles publishers.

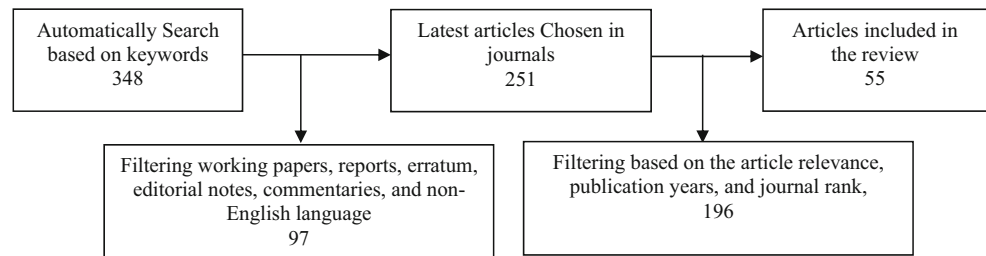
3 Review of online knowledge sharing mechanisms

One of the significant developments of knowledge management in the networked organization is the application of information and communication technology (ICT) to support knowledge sharing among its members (Keats et al. 2005). There is no doubt that ICTs, particularly the Internet, can contribute to the effective dissemination and exchange of information and knowledge (Van Doodewaard 2006). Today’s, the most influential role of the Internet is bringing people together to share experiences and advices (Nilmanat 2011). Knowledge sharing environments can be online or offline. The distinction between them is conventionally seen as the distinction between computer-mediated communication and face-to-face communication, respectively. Following the emergence of the Internet, electronic negotiation has become a new alternative for face-to-face business negotiations (Rodon et al. 2005). Online communities have become increasingly popular in recent years. Online environment is a computer interface from which various tasks can be performed (Gauthier and Krajicek 2013). However, despite of a significant growth in the number of online communities, few of them have been successful in retaining members and motivating members to contribute knowledge (Lai and Chen 2014). Since the electronic resources and web sites became popular,

Table 1 Electronic databases used in SLR

Online database	Url
ScienceDirect	http://www.sciencedirect.com/
Springerlink	http://link.springer.com/
Web of Science	https://apps.webofknowledge.com
IEEE	http://ieeexplore.ieee.org/

Fig. 1 An overview of the used process to identify the articles



distance education courses offered via the Internet could play an important role in providing global digital resources with electronic and web resources (Sche 2002). Online networks can be construed as social networks in which people engage in interactions, build relationships, share information, and request and extend assistance to each other using electronic communication technologies (Huang and DeSanctis 2005).

Performance expectation and self-efficacy belief play essential roles in knowledge-sharing participation in online community of practice (Tseng and Kuo 2014). Self-efficacy, perceived enjoyment, certain personal outcome expectations, and individual attitudes towards knowledge sharing are positively related to the intention of knowledge sharing in employee weblogs (Papadopoulos et al. 2013). In addition, reputation would affect knowledge sharing attitude of groups, members and a sense of self-worth, which directly and indirectly affects the attitude. In addition, social virtual world provides several collaborative capabilities, such as social networking and instant messaging, participants may interact and share useful knowledge with a friendly interface (Zhang et al. 2014; Zhou et al. 2012). Social networking and sharing culture (fairness, identification, and openness) is the most significant factor directly affect knowledge sharing and indirectly influence the sharing through the subjective norm and knowledge sharing attitude in social networking sites (Pi et al. 2013). Also, Yang (2015) has showed that the communication media of marketing campaigns significantly affected Knowledge sharing. In this section we reviewed articles about online knowledge sharing until 2015.

The articles until 2000 are discussed mostly the facilitating of the online knowledge sharing where a variety of communication formats were discussed as potentially valuable in

making the connections that can facilitate and support learning communities. From 2000 to 2005, about 25 articles were found. The important issues that examined in these years, were the sustainability and successful of online knowledge-sharing communities (Gnasa 2004; Whitworth and Biddle 2005). Many approaches to knowledge-sharing have suffered from the lack of active user participation (Rosenblatt 2003). Tian (2005) has suggested that the promotion of the mutual benefits may lead to increased active participation and thus a more sustainable online community. Also, Tian et al. (2004) have proved that mutual benefits among participants will lead to positive participation. Pan et al. (2001) have showed that successful knowledge sharing is dependent not only on the use of particular information technologies but also on the successful creation of a knowledge-sharing environment with a knowledge management-focused HRM as the coordinator of related activities. Furthermore, knowledge sharing through online communities has been discussed by many researchers such as: (Ardichvili et al. 2005; Braun and Hollick 2004; Jorge et al. 2002; Kurubacak 2005a, b; Lueg 2003; Rafaeli et al. 2003; Sche 2002; Einstein et al. 1935; Zhang and Hiltz 2003). Their obtained results indicated that knowledge sharing in the online space makes that the sharing process done easier, information will be faster released, and saves on time, but still are many people who prefer face-to-face conversation.

Obtained articles through our article selecting process from 2006 to 2010 are 90 articles. Hew and Hara (2006), Hara and Foon Hew (2007), Hew and Hara (2007a, b) have identified the important factors that encourage and hinder knowledge sharing in online community. The results showed five factors that aided to knowledge sharing process: (1) self-selection type of membership, (2) desire to improve the nursing

Table 2 Paper selection funnels in each category

Knowledge sharing mechanisms Stage	Online knowledge sharings			
	Until 2000	2001–2005	2006–2010	2011–2015
S 1	348			
S 2	Journals 197	Conference 44	Books 10	
S 3	Categorize articles by year			
	1 article	25 articles	90 articles	135 articles

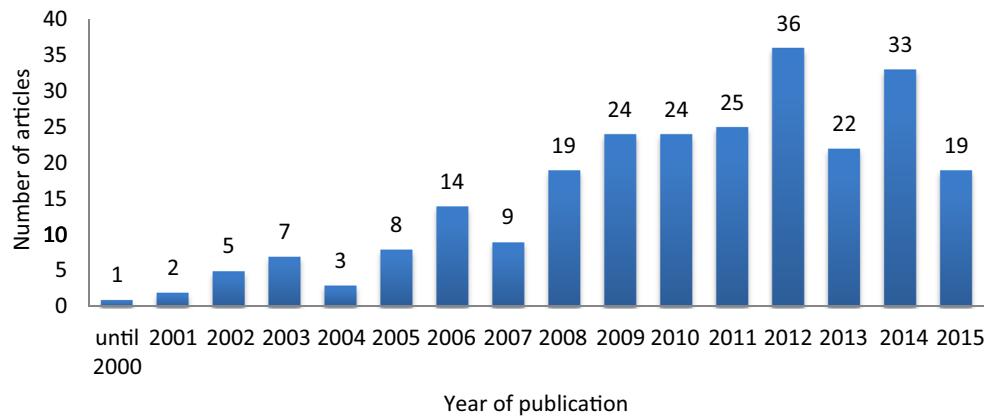
Table 3 Distribution of articles by journal, conferences and books the subject online knowledge sharing

Publisher	Year	Authors
Elsevier	2009	(Hou, Sung, & Chang)
	2010	(E.-J. Lee & Jang)
	2011	(W. W. Ma & A. H. Yuen)
	2012	(Y.-M. Li, Liao, & Lai), (Qun & Xiaocheng), (Din & Haron)
	2013	(Jadin, Gnams, & Batinic), (Vogel et al.)
	2014	(F.-C. Tseng & Kuo), (W. W. Ma & Chan), (Lai & Chen)
	2015	(Wei, Lin, Chen, An, & Yeh), (Pee & Lee)
Springer	2003	(Y. Li, Thompson, Tan, Giles, & Gharib)
	2002	(Jorge, Moyle, & Voß)
	2007	(Hew & Hara)
	2008	(Chieh)
	2010	(Tee & Karney), (W. W. K. Ma & Yuen)
	2011	(W. W. K. Ma & A. H. K. Yuen), (Jin & Zhou)
	2012	(C.-P. Lin & Joe)
	2013	(Segers)
	2014	(L.-C. Huang, Ting, & Chou), (Zhu, Gao, & Nohdurft)
	2015	(G. A. Wang, Liu, Wang, Zhang, & Fan)
IEEE	2007	(Huffaker & Lai)
	2008	(Thoms, Garrett, Herrera, & Ryan)
	2009	(Godara, Isenhour, & Kavanaugh), (Nilmanat), (Z. Liu, Wang, & Zhang)
	2010	(G. Li & Li)
	2012	(S. Law & M.-K. Chang), (Saadatmand & Kumpulainen)
	2013	(Havakhor & Sabherwal), (Seliaman)
	2014	(Zheng, Zhang, & Wang), (Abouzahra & Tan), (G. A. Wang, Wang, Li, & Fan)
Emerald	2015	(Pee)
	2006	(Ardichvili, Maurer, Li, Wentling, & Stuedemann), (Matlay, Braun, & Hollick)
	2007	(Hara & Foon Hew)
	2010	(Matthews, Matthews, & Stephens)
	2012	(L.-A. Ho, Kuo, & Lin), (Cervellon & Wernerfelt), (Schiuma et al.), (Nistor, Baltes, & Schustek), (Claudio Bosio et al.), (T.-M. Choi et al.)
	2014	(C.-C. Liu, Lin, Deng, Wu, & Tsai)
Taylor	2015	(Sloan, Bodey, & Gyrd-Jones), (Hsu), (de Kervenoael, Bisson, & Palmer), (Bourdon, Kimble, & Tessier)
	2001	(Pan, Hsieh, & Chen)
	2008	(Chalkiti & Sigala)
	2009	(Hildrum)
	2011	(Strang), (K. Kim & Tse), (M.-F. Chen & Yen)
Sage	2015	(Sheng & Hartono)
	2010	(C.-P. Lin), (Suh & Shin)
Wiley	2012	(H. Lee, Reid, & Kim), (Booth)
	2006	(Hara et al.)
Wiley	2007	(Hew & Hara), (Wei Li, Downey, & Wentling)
	2012	(Oh), (Erden, Von Krogh, & Kim)
	2013	(Majchrzak, Faraj, Kane, & Azad), (Cheung et al.)
	2014	(S. Khan, Meyers, Gowen, & Bergman)
	2014	(S. Khan, Meyers, Gowen, & Bergman)
AISel	2002	(Lertpittayapoom & Paul)
	2003	(Y. Zhang & Hiltz)
	2005	(S. Huang & DeSanctis), (Keats, Watson, & Yoong)
	2006	(Tianjiao, Cheng, & Lihua)
	2008	(Mason, Castleman, & Parker), (Shek & Sla)

Table 3 (continued)

Publisher	Year	Authors
ACM.DL	2009	(Meng & Gong), (W.-K. Lin, Ma, Lin, & Chiu), (Hashim & Tan), (Jeongwon Yang & Shim), (Wende & Haghirian)
	2010	(Alrushiedat, Olfman, Kung, & van der Pol)
	2011	(Mojdeh & Head)
	2013	(Salovaara & Tuunainen)
	2003	(Subramani & Rajagopalan)
	2004	(Gnasa)
	2006	(Hansen)
	2008	(Nagi & Della Senta)
ERIC	2012	(Gilbert & Mark)
	2014	(G. A. Wang, H. J. Wang, J. Li, A. S. Abrahams, et al.)
	2005	(Ardichvili, Maurer, & Wentling), (Kurubacak), (Kurubacak)
	2008	(Trentin)
Citeseer	2011	(Chao, Hwu, & Chang)
	2012	(A. Lee et al.)
	2005	(Whitworth & Biddle)
	2006	(Salamata, Fudzeeb, Mahdinc, & Mohamadd)
Other publishers	2008	(C Lueg), (Tørning)
	2010	(Nasir)
	1944	(Penny-Light et al.)
	2001	(Einstein et al.)
	2002	(MARKETING-AFramework),(da Cruz),(Sche)
	2003	(Soller & Lesgold), (Christopher Lueg), (Sharratt & Usoro), (Rafaeli, Barak, Dan-Gur, & Toch), (Rosenblatt)
	2004	(Braun & Hollick), (Y. Tian, Lau, & Dew)
	2005	(Y. Tian), (Low, Ong, & Low)
	2006	(Hew & Hara), (Van Doodewaard), (Hew), (T. Chen, Zhang, & Huang), (Ahmad & Ewe), (Le), (Hollick & Braun)
	2007	(Wei Li, Ardichvili, Maurer, Wentling, & Stuedemann 2007), (Gustafsson & Falkman), (Racherla & Hu), (Godara)
	2008	(Young & Tseng), (Durante), (Wei Li), (Sale), (Burke & Sulaiman), (Singh), (Tazelaar), (P. Wang & Liu), (Sabetzadeh), (Temizi)
	2009	(Zach & Agosto), (Wei Li), (Muhamad Ali & Mohammad Yusof),(Limpisook), (Levy), (H. Kim & Stefanone), (Hou & Sung), (Matayong),(Hartono),(Malik),(Toral Marín, Barrero García, & Martínez Torres), (McCready & Marcus), (Hannuksela)
	2010	(Jiang Yang, Wei, Ackerman, & Adamic), (L.-A. Ho, Kuo, Lin, & Lin), (C.-P. Lin), (Suh & Shin), (Cao, Qin, & Liu), (L.-x. Bai & Liu), (M.-F. G. Lin, Herrick, Davids, & Tsai) (Z. Liu, Wang, Wu, & Zhang), (Topousis, Lebssock, & Dennehy), (Hermanrud & Eide), (Hau) (Maloles et al.), (Boonmee), (Lefika), (Wu)
	2011	(Booth), (Botezat, Ionescu, Paun, Drumea, & Lazaroiu), (Bamberg & Lehtonen), (Nilmanat), (Alajmi), (N. I. S. Sulaiman & Burke), (Soon & Fraser), (Yunduan), (Y.-Y. Huang & Hsia), (W. Tian), (Quinto), (Wei Li), (J. Bai & Zhang), (Maung), (Lăzăroiu, Botezat, Păun, Drumea, & Ionescu), (Stoica), (Reinfried), (Koc-Michalska & Lilleker)
	2012	(W. W. Ma), (W. W. Ma), (Cervellon & Wernerfelt), (Stewart & Abidi),(Booth),(H. Lee et al.), (Smith, Baxter, Boss, & Hunton), (Alajmi), (Hashim), (Majewski), (Kutay, Riley, Mooney, & Howard-Wagner),(Yu),(Rui-li), (Jensen & Grindsted),(Zhou & Zuo), (Kosonen, Gan, Blomqvist, & Vanhala), (S. W. Tian, Vogel, & Tan), (Sensuse & Tampahan)
	2013	(Saadatmand & Kumpulainen), (Chang, Hsu, Liao, & Lin), (Tewksbury),(Denner & Blackman), (W.-k. Ma, Chu, & Hui), (Majchrzak et al.), (X. Li), (Ostrander),(Segers), (Tjen), (Chua & Balkunje), (Libreri), (Ngwenya, Annand, & Wang 2013), (Grosbois), (Schutt)
2014	(Hwang, Singh, & Argote), (Hara & Fichman), (M. R. Haas, P. Criscuolo, & G. George), (M. R. Haas, P. Criscuolo, & G. George), (W. W. Ma & Chan), (Ma & Chan), (M. Haas, P. Criscuolo, & G. George), (Hara), (Russ-Eft), (Ismail & Hosseini), (A. W. Khan, Chaudhry, & Planning), (J. Cheng), (Kang), (Mojdeh), (Zhimin, Jiangle, & Yiping), (Chohan, Shah, Larson, & Welch), (Myburgh), (J. Wang, Song, Jin, & Ren), (Gan & Huosong), (Khalil, Atieh, Mohammad, & Bagdadlian), (Houston, Barker, Clarke, & Mew), (Amila & Suryadi)	
2015	(Guimarães, da Silva, & Almeida), (Hwang, Singh, & Argote), (Hashim, Ahmad, & Shahrane), (Mutoka), (Montash, Dwivedi, & Vidgen), (Chuang), (Helsing), (Enck, Campbell, Tap, Arnoux, & Antoine), (Utakrit & Utakrit), (Inoue, Yamaguchi, & Takada)	

Fig. 2 Distribution of articles by year of publication

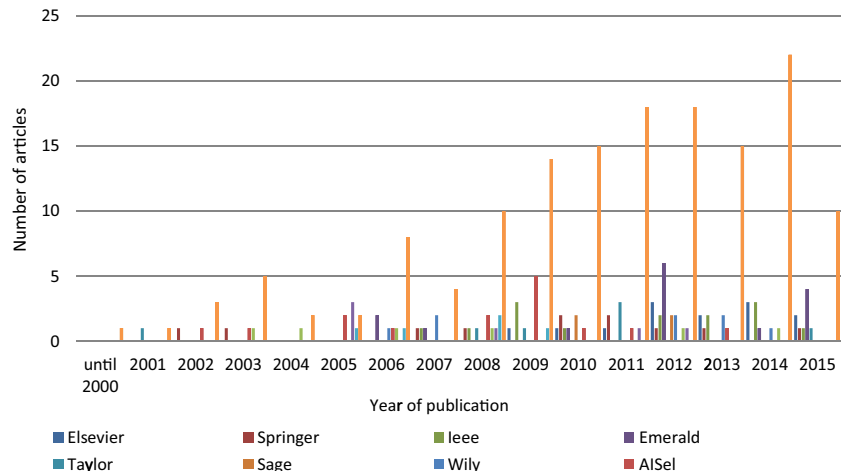


profession, (3) reciprocity, (4) a non-competitive environment, and (5) the role of the listserv moderator. Regarding barriers for knowledge sharing, six factors were found: (1) no new or additional knowledge to add, (2) unfamiliarity with subject, (3) lack of time, (4) technology, (5) lack of knowledge, (6) and competing priority. Also, the factors that have helped sustain knowledge sharing within the online community of practice include: (1) a self-selection; (2) validation of one’s practice with others who share a similar working situation; (3) a need to gain better understanding of current knowledge and best practices in the field; (4) a non-competitive environment; (5) the asynchronous nature of the online communication medium; (6) and the role of the listserv moderator. Also, Ho et al. (2010) have investigated the relationships between knowledge management system quality, employee computer attitude, trust at workplace and online knowledge sharing. They showed that the trust at the workplace has a mediating effect on online knowledge sharing within organizations. It is also discovered that there is significant correlation between IT quality, employees’ computer attitude and online trust at the workplace. Also, Young and Tseng (2008) have investigated interplay between physical and virtual settings for online Interpersonal trust formation in knowledge-sharing

practice. Analysis revealed three important facets of the interpersonal trust formation process in using Web-based knowledge management system: (1) the social role of the teachers, (2) the rigid and tight professional community, and (3) the keys to breaking through. Other researchers, such as: Ardichvili et al. (2006), Li (2009) and Li et al. (2007a) have explored cultural factors influencing knowledge sharing strategies in online communities of practice. They showed that the overall influence of the national culture could be less pronounced in online knowledge sharing than what the literature has suggested.

Also, a degree of competitiveness among employees can be serious barriers to information sharing. Suh and Shin (2010) reviews the effects of online social ties on knowledge sharing, and discovered that the frequency of online interaction does not affect knowledge sharing in collocated teams, while it plays a critical role in stimulating motivational factors that affect knowledge sharing of dispersed teams. Also, Huffaker and Lai (2007) and Ma and Yuen (2010) have explored the motivational factors to online knowledge sharing. It is found that perceived online attachment motivation and perceived online relationship commitment are two determinants to online knowledge

Fig. 3 Distribution of articles by publisher



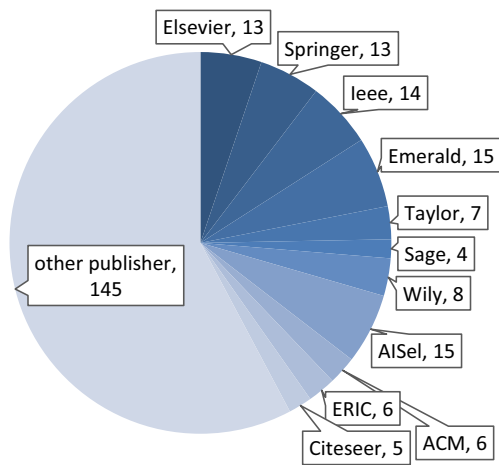


Fig. 4 A pie chart of the percentage of the online knowledge sharing articles based on different publishers

sharing. Huffaker and Lai (2007) have indicated that younger workers and those new to an organization, are more motivated by ‘self-interest’ factors such as gaining name recognition and impressing management, while older workers, and those with a longer tenure, are motivated by more altruistic factors such as sharing and mentoring. Hildrum (2009) finding that motivation can be facilitated through the participation in online networks of practice, but in order to access and benefit from these networks people require a certain threshold level of technical relevant knowledge, which is the most easily generated in local communities of practice. Also, Limpisook (2009) have explored the relationship between three kind of motives (achievement motive, affiliation motive, and power motive) and community members’ behavioral intentions, together with the moderating effect of members’ opportunity, ability and trust., the main findings indicated that achievement motive plays the most important role in motivating members to share their knowledge and lead to their intentions to participate, recommend the community to others and be loyal to a brand. However, marketers need to create the trustworthy environment within the community. Hau (2010) has showed that intrinsic motivation, shared goals and social trust are the salient factors to promote users’ innovation-related knowledge sharing. Eventually, G. Li and Li (2010) have investigated how the dimensions of members’ social capital interacting influences on knowledge sharing behavior in learning online community. The analytical results demonstrated that reciprocity and social interaction ties exerted significant impacts on knowledge sharing in learning online communities. Nilmanat (2009) has investigated the image usage and tacit knowledge sharing in online communities. They showed that online community users embed digital images in their messages to aid their tacit knowledge sharing. The obtained results from articles in this period of time, showed that most of researchers have examined in relation to motivation to the knowledge sharing and also trust in virtual

environments research. Therefore, trust plays a key role in successful social interaction for content sharing and dissemination in such social media-sharing communities.

Articles from 2011 to 2015 are nearly 135 articles. Nowadays, online forums have become a useful tool for knowledge management in Web-based technology (Li et al. 2012). In Web 2.0 environments, people commonly share their knowledge and personal experiences with others (Oh 2012). Cervellon and Wernerfelt (2012) have investigated the knowledge content on green fashion and the expectations regarding the sustainable supply chain held by consumers and shared within online communities. Their results showed a switch in knowledge content between the two periods, from a focus on sustainability with a focus on fashion. Also, Lee et al. (2012b) have explored the nature of knowledge sharing in online travel communities by proposing three types of antecedents: individual, community, and affiliation. Their findings showed that, community identification is positively influenced by a member’s travel involvement and community benefits, strong identification strengthens a member’s sharing intentions, and the postulated relationships differ based on a member’s interaction mode. Saadatmand and Kumpulainen (2013) have investigated out how participants create and utilize their personal learning environments for searching, aggregating, creating and sharing content and learning resources, and being engaged in online learning networks and communities. Their findings suggest the serendipitous nature of content aggregation in a personal learning environment and provide evidence of serendipity as a valuable and unexpected source for learning. Finell, Chao et al. (2011) have explored the concept of knowledge sharing is applied to achieve the appropriate interaction among participants in an online learning environment. They realized that learners assigned with interaction supported by knowledge sharing flows have better success in terms of learning effectiveness. That is, the concept of knowledge sharing significantly influences the interaction throughout the use of a learning platform and is a way to enhance the learning effectiveness.

Chang et al. (2013) have investigated factors that may influence knowledge-sharing behaviors, and how the individual’s role in knowledge sharing influences the process. The results showed that the behavioral intentions of knowledge sharing are positively associated with subjective norm, trust, and media richness. Also, Cheung et al. (2013) have examined why members continue to share knowledge in online communities of practice. Their results showed that when members found that they receive the reciprocity they expected, they will feel satisfied. Both satisfaction and knowledge self-efficacy further affect their intention to continue sharing knowledge in an online community of practice. Furthermore, Sheng and Hartono (2015) have explored how social capital facilitates the creation and sharing of knowledge in online communities. Their results showed (1) why and how knowledge is created

and shared, cultivated in online communities and then adopted by firms; (2) how social capital positively facilitates the creation and sharing of knowledge in online communities; and (3) how the process of creating and sharing knowledge nourishes the following outcomes which benefit the firm. Also, it accelerates the development of new products, enhances relationships with partners, raises the level of environment and community involvement, creates customer acknowledgement, and intensifies product and service innovation. In addition, Hsu (2015) has presented a conceptual model of how both the benefits and risks of social capital influence online knowledge sharing among virtual community members towards enhancing members' relationship continuity and virtual community reputations. The results showed the benefits of social capital and complementary resources have a positive effect on knowledge sharing, thereby strengthening relationship continuity and community reputation. Furthermore, the risk of social capital has a negative effect on knowledge sharing, as expected. L.-A. Ho et al. (2012) have investigated the relationships among knowledge management system quality, employees' self-perceived social identification, trust at workplace as well as online knowledge sharing behaviors, and, also, demonstrated the direct and indirect effect of social identification and trust at workplace on online knowledge sharing from the perspective of knowledge management system quality. The results showed that social identification and trust at workplace have a mediating effect on online knowledge sharing within organizations; trust at workplace is the stronger mediator than social identification; social identification has a positive and significant impact on trust at workplace; and there is significant correlation between knowledge management system quality and social identification as well as trust. Seliaman (2013) has investigated the adoption and use of online discussion forums virtual communities located in different places in the world. The results showed that the social influence and online social skills influence users' acceptance of online discussion forums for social relations and knowledge sharing.

Yunduan (2011) has explored problems and solutions to sharing tacit knowledge in online learning communities. Main problems include difficulty in communicating tacit knowledge, members' monopoly on tacit knowledge, and learning culture and members' competencies. The proposed solutions cover adopting an incentive mechanism to promote knowledge sharing, fostering an open learning culture, providing relevant support and emphasizing individual members' self-directed learning and reflection. Additionally, Nilmanat (2011) has investigated how online community users use images to share their tacit knowledge. The results from study suggested that image usage can assist online community users in tacit knowledge sharing by helping these users share knowledge that is difficult to communicate, problematic, and contextual easier. On the other hand, Law and Chang (2012b)

have anticipated status enhancement and community identification were identified as two mediators between social capital and the willingness to contribute knowledge. They showed that two mediators affect knowledge contribution positively. Except shared language, all other social capital factors, namely, instrumental network ties, expressive network ties, community trustworthiness, and norms of cooperation have significant positive effects on the mediators and their indirect effects on knowledge contribution are also significant. Also, Li (2015) has explored perceived ethics as a new dimension to an established online knowledge sharing model. They showed that perceived online attachment motivation had a direct, positive, and significant effect towards online knowledge sharing behavior. Perceived ethics, however, had an inverse relationship with online knowledge sharing behavior. Also, Zhu et al. (2014) and Din and Haron (2012) have explored how culture plays a role in knowledge sharing within the social interaction context based on virtual internet platform of online social networking. Study findings showed online that social networking culture is related to knowledge sharing as a way of life.

Majid et al. (2014) have investigated students' preference for participation in face-to-face and online discussions, and the factors that can either motivate or pose barriers to knowledge sharing. The results showed that a majority of the students preferred in-class face-to-face discussions for knowledge sharing and a majority of them agreed that the factors such as encouragement by instructors, challenging discussion topics, and thought provoking questions from instructors and classmates were likely to motivate them to participate. The motivating factors for participation in online discussions were: more time to refine ideas, less nervousness, and flexible access to online discussion boards. The major barriers to face-to-face participation were shyness and uninteresting topics. Furthermore, Tjen (2013) has examined the influence of intrinsic and extrinsic motivation toward individual investment performance through knowledge-sharing behaviors by individual investor in online stock trader communities. They found that the motives for trading profit, monetary reward, reputation feedback and altruism have positively influenced individual investment performance via knowledge-sharing behavior, while the motives of reciprocity and self-efficacy has shown no significant influence. Finally, Khan et al. (2014a) have explored the influence of demographic factors on the online knowledge sharing behavior. The findings provided a better insight to the indifferent role of demographic diversity of students when it comes to online knowledge sharing as a result of online social interaction. The results of this interval of time shows that the researchers from 2011 to 2015 examined different issues such as, online knowledge sharing role in learning, effective factors on knowledge sharing behavior in the online environment, The impact of social capital on

knowledge sharing online, trust in the online environment, existence or absence of culture of knowledge sharing in the online environment, and etc. The results shows that knowledge sharing in virtual environments used in all fields. So, knowledge sharing in the online environment increases the speed of doing things, enhances the innovation, improves the efficiency, increases the sales volume, reduces the face to face relationships, reduces transportation costs, and etc.

4 Results and comparisons

In the previous section, we have surveyed an online knowledge sharing articles. We described online knowledge sharing articles in four main categories including until 2000, 2001–2005, 2006–2010, 2011–2015. We found that online environment directly or indirectly effect on knowledge sharing. The factors that directly affect knowledge sharing are more important than the factors that have an indirect effect. The effect of these factors may be helpful or harmful. During our review, we found that knowledge sharing is the important key to maintain organizations in a world of flexibility and competitiveness. In general, the most important advantages of these techniques are: first, online knowledge sharing can increase employee's productivity and performance. Second, online knowledge sharing can increase the creativity and quality of communication. Third, publishing online knowledge sharing of information systems makes the information share in a short period in the world. Fourth, Web 2.0 facilitated web-based information sharing, even knowledge sharing in an online environment. However, it has some weakness where the most important of these weaknesses are: first, motivating individuals to share knowledge to form of is not an easy task. Second, Lack of confidence has between users in virtual environments. Third, traditional thoughts and opinions prevent the online knowledge sharing in organizations. According to the performed SLR of online knowledge sharing up to 2015, we determined the number of published articles have very high 2012 and 2014. In addition, the greatest number of articles published in famous journals. Emerald and AISeL with 6.2 %, IEEE with 5.7 %, Elsevier and Springer with 5.3 % of published articles (among 251 articles) have the highest publish articles in journals and conferences respectively.

5 Open issues

This section offers several important issues that have not been comprehensively and thoroughly studied until now as research directions in the development of online knowledge sharing in organizations and communities. By discussing and analyzing the mentioned state of the art techniques, it has been observed that there is not any independent technique

that addresses all issues involved in online knowledge sharing. For example, some articles consider providing trust and motivation while some totally ignore these issues. Also, security and privacy are the important challenging research areas that are not considered in many of online knowledge sharing articles. In addition, trust and reputation can be considered for enhancing the security of online knowledge sharing technique. Designing a robust mechanism to improve the performance of online knowledge sharing technique will become a challenging problem. Future studies should consider examining the barriers to online knowledge sharing, as it is equally important to develop insights on what hinders the sharing of knowledge and pay attention to the costs associated with online knowledge sharing rather than just benefits. Future research can compare the blogging behavior between IT and non-IT organizations. Investigating the level of self-efficacy and its influence on performance expectation is very interesting line for future researches. A new model that able more and more the complete aspect can be recommended for future works.

Knowledge management using information technology should be implemented into users' main activities thus avoiding surplus activity (Akiyoshi 2008; Tseng and Huang 2011). Due to the advances of Web technologies, there are more and more new social networking sites with different focuses and characteristics. Technologies such as Wikipedia and Facebook are transforming the way people share knowledge with each other. Thus, they should enhance its content, technical and social values to attract more users to participate in knowledge sharing and improve their job performance. For example, to improve content value Wikipedia could post various types and volumes of information and improve article presentation and organization; to improve technical value it could focus on providing user-friendly online tools and supporting usability and sociability in the cyber environment; to improve social values it could form remuneration systems so that users are encouraged and willing to share their experience and knowledge with others meanwhile maintaining their position and participating (Tseng and Huang 2011). Also, we can form the social networking sharing culture. For example, the site administrators may set up rules for rewards and punishments clearly and put them into effect. Or, the site administrators may frequently organize different activities to promote members' interactions and communications. Members would identify themselves as one of the group and thus they would be willing to continuously contribute their knowledge to the site. Finally, administrators may provide positive feedbacks to those members who contribute their knowledge to enhance the members' sense of self-worth and reputation. However, Wikipedia and Facebook consists of groups covering a variety of topics. Different topics may include different specialized domain knowledge. Members' knowledge sharing behavior across different specialized groups may be different.

Future studies may focus on different types of groups and examine whether the difference of members' knowledge sharing behavior across groups exist, and who owns the intellectual property or knowledge given by members of the firm? When people register, contribute, and share knowledge in an online community, they are aware that it may be incorporated into a new product, service or organization. Members may later claim ownership of knowledge.

The world faces a growing number of regional and global problems that no nation has the authority, capability, or resources to solve on its own. Transnational public sector knowledge networks are emerging as a form of collaboration that operates across national and cultural boundaries on the basis of expertise and information rather than through the traditional channels of diplomacy among sovereign powers. In online social media-sharing communities, each user has the responsibility to evaluate the quality of content before he or she accepts and transfers it. Therefore, trust plays a key role in successful social interaction for content sharing and dissemination in such social media-sharing communities. Also, there are a number of the key motivators of online knowledge sharing (i.e., reputation, reward, moral obligation, commitment) that researchers can explore with respect to the evaluation processes and their impacts on members' intention to continue sharing knowledge in an online community of practice. Also, further studies may extend to the ethical and unethical dimensions that influence online knowledge sharing. Other constructs such as personal value, organization's commitment or social norm may be determinants of the ethical dimension that influencing knowledge sharing.

6 Conclusion

In this paper, we have surveyed the past and the state of the art articles in online knowledge sharing domains systematically. According to the performed SLR of online knowledge sharing until 2015, we obtained that the number of published articles has very high in 2012 and low in 2011. In addition, the greatest number of articles published in famous journals. Emerald and AISel with 6.2 %, IEEE with 5.7 %, Elsevier and Springer with 5.3 % of published articles (among 251 articles) have the highest publish articles in journals and conferences respectively. Also, we comprehensively reviewed the online knowledge sharing, that, what topics investigated, and the results were collected. In the end, some interesting lines for future researches are provided where online discussion forums have become a popular knowledge source for sharing information or solving problems. Also, online communities have become popular knowledge sources for both individuals and organizations. So, many organizations have launched online knowledge-exchanging communities to promote knowledge

sharing among their employees. The results showed that the knowledge sharing in online environment helps to increase the success of the organizations, enhance the creativity, and optimize the learning effect. In addition, the knowledge sharing in an online environment needs to earn the trust and satisfaction of users and improves the job performance. In addition, a specific technique to provide all mentioned issues will become a challenging problem and are interesting lines for future research.

There are several limitations in this study. Firstly, this study only surveyed articles which were extracted based on a keyword search of "online knowledge sharing". Articles which mentioned the application of online knowledge sharing techniques, but without a keyword index could not be extracted. Secondly, this study limited the search for articles to 5 online databases. There might be other academic journals which may be able to provide a more comprehensive picture of the articles related to the online knowledge sharing. Lastly, non-English publications were excluded from this study. We believe research regarding the application of online knowledge sharing techniques have also been discussed and published in other languages.

Appendix 1

Basic concepts

This section introduces the basic concepts and related terminologies that used in the paper. In this regard, the following concepts and terminologies are explained:

Creativity: creativity is the making of new and useful ideas in any domain and is a phenomenon by which a new and valuable thing such as an idea is formed.

Innovation: innovation is the successful execution of creative ideas within an organization (Yeh et al. 2012). It can be viewed as the application of better solutions to meet new requirements, inarticulate needs, or existing market needs (Lubart and Mouchiroud 2003).

Institutional orientation: institutional orientation means the ones which are formal through rules or laws, or informal through certain cultural expectations between supply chain members (Cheng and Fu 2013).

Knowledge: Knowledge is a familiarity, awareness, or understanding of someone or something, such as information, facts, descriptions, or skills, which is acquired through experience or education by perceiving, discovering, or learning. Besides, it is gained via experience, communication or inference as accumulated information (Pi et al. 2013). Knowledge can refer to theoretical or

practical understanding of a subject where it can be implicit or explicit (Dictionaries 2010).

Knowledge sharing: knowledge sharing means that an individual, team, and organization share the knowledge with other members of the governing body in the form of activities through the various ways (Qun and Xiaocheng 2012). Also, it is an activity through which knowledge are exchanged between people, allies, families, communities, or organizations (Gupta et al. 2004; Williams and Bukowitz 1999).

Knowledge management: knowledge management is getting the knowledge about customers, constantly improving it and sharing it through those parts of the organization, which need the knowledge to use it (Sulaiman et al. 2011). It adverts to a multi-disciplined approach to accomplish the organizational objectives by creating the best usage of knowledge (Radford et al. 1968).

Supply chain: supply chain encompasses the steps it takes to get a good or service from the supplier to the customer (Gould 2004).

Wikipedia: Wikipedia is a free online knowledge database that allows people to search, compose, and edit contents according to some basic rules, and absorb knowledge through the knowledge sharing process (Sie et al. 2009).

Appendix 2

Table 4 The abbreviation is the used terms in the paper

Abbreviation	State
IT	Information Technology
IS	Information System
ICT	Information and Communication Technology
KS	Knowledge Sharing
KM	Knowledge Management
SLR	Systematic Literature Review

Appendix 3

Table 5 The reviewed articles in section 3

Publisher	Author	Journal or conference name
Elsevier	Li et al. (2012)	Information Processing & Management
	Din and Haron (2012)	Procedia-Social and Behavioral Sciences
Springer	Jorge et al. (2002)	Collaborative Business Ecosystems and Virtual Enterprises
	Hew and Hara (2007a)	Educational Technology Research and Development
	Ma and Yuen (2010)	Hybrid Learning
	Zhu et al. (2014)	Cross-Cultural Design
	Majid et al. (2014)	The Emergence of Digital Libraries–Research and Practices
IEEE	Li (2015)	New Media, Knowledge Practices and Multiliteracies
	Huffaker and Lai (2007)	Advanced Learning Technologies, 2007. ICAIT 2007. Seventh IEEE International Conference on
	Nilmanat (2009)	Computing, Engineering and Information, 2009. ICC'09. International Conference on
	Li and Li (2010)	Management of Innovation and Technology (ICMIT), 2010 I.E. International Conference on
	Law and Chang (2012b)	System Science (HICSS), 2012 45th Hawaii International Conference on
Education resources information center	Seliaman (2013)	Computer and Information Technology (WCCIT), 2013 World Congress on Online Submission
	Ardichvili et al. (2005), Kurubacak (2005a, b)	
	Chao et al. (2011)	Turkish Online Journal of Educational Technology-TOJET
Emerald	Ardichvili et al. (2006)	Journal of knowledge management
	Hara and Foon Hew (2007)	Information Technology & People
	Ho et al. (2012)	Internet Research
	Sheng and Hartono (2015)	Online Information Review
Wiley	Hew and Hara (2007b)	Journal of the American Society for Information Science and Technology

Table 5 (continued)

Publisher	Author	Journal or conference name
	Oh (2012)	Journal of the American Society for Information Science and Technology
	Cheung et al. (2013)	Journal of the American Society for Information Science and Technology
Taylor	Pan et al. (2001)	Journal of Organizational Computing and Electronic Commerce
	Hildrum (2009)	Industry and Innovation
	Sheng and Hartono (2015)	Total Quality Management & Business Excellence
SAGE	Suh and Shin (2010)	Journal of Information Science
	Oh (2012)	Journal of Hospitality & Tourism Research
Inderscience	Lueg (2003)	International journal of electronic business
	Nilmanat (2011)	International Journal of Innovation and Learning
ResearchGate	Rafaëli et al. (2003)	Proceedings Online of IADIS
	Hew and Hara (2006)	Journal of Interactive Online Learning
IGI Global	Li et al. (2007a)	International Journal of Knowledge Management
	Li (2009)	International Journal of Knowledge Management (IJKM)
EDITLib	Saadatmand and Kumpulainen (2013)	International Journal of Emerging Technologies in Learning (iJET)
	Chang et al. (2013)	World Conference on Educational Media and Technology
Airiti	Limpisook (2009)	International Institute of Management Master Program Thesis Kung University
	Tjen (2013)	International Institute of Management Master Program Thesis Kung University
Librarine Resources	Young and Tseng (2008)	CyberPsychology & Behavior
World Scientific	Ho et al. (2010)	International Journal of Information Technology & Decision Making
Storming Media	Einstein et al. (1935)	Naval Postgraduate School Monterey CA
Socialist Studies	Penny-Light et al. (1944)	Language and Literacy
CNKI	Sche (2002)	Modern Library and Information Technology
AISeL	Zhang and Hiltz (2003)	AMCIS 2003 Proceedings
Academic conferences international	Tian et al. (2004)	White Rose
28th Australian new Zealand regional science association international	Braun and Hollick (2004)	28th Australian New Zealand Regional Science Association International (ANZRSAl), Wollongong, NSW, Australia, 28 September – October 1 2004
KOASAS	Hau (2010)	Korea Advanced Institute of Science and Technology
China National Knowledge Infrastructure	Yunduan (2011)	Distance Education in China
ingentaconnect	Cervellon and Wernerfelt (2012)	Journal of Fashion Marketing and Management
Johar Educational Society	Khan et al. (2014a)	Pakistan Journal of Commerce and Social Sciences
ACM	Gnasa (2004)	Proceedings of the 27th annual international ACM SIGIR conference on Research and development in information retrieval
Massachusetts Institute of Technology	Rosenblatt (2003)	University massachusetts Institute of Technology
Citeseer	Whitworth and Biddle (2005)	Carleton University
University of Leeds	Tian (2005)	University of Leeds

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