User Influence on Knowledge Grid Model among Big Data Community to Promote Knowledge Sharing

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Abstract

The significance of big data has benefited various organizations to improve their decision making, services and, productivity, while knowledge grid provides the platform to effectively capture, share, publish and manage knowledge resources to answer the questions from masses of data. However, the user's role in these process and it influences still unclear. Therefore, this paper aimed to analyses the users impact in knowledge grid components in big data community. In this way, the research narrows the big data community members to data scientists who are able to make the structure for large quantities of formless data. This study flows the user's roles from the human layer of knowledge grid to the other layers and combined it findings with user's expectation of suitable model to promote knowledge sharing to clear the community member's roles from the first step of designing a knowledge grid model till the facilitating knowledge sharing.

Keywords: Knowledge grid; Big data community; Knowledge sharing.

1. Introduction

Big data as a huge pool of data become the main concern for many organizations activities to improve their decision making, services, and productivity. Therefore, the variety of data sources should combine which required collaboration between organizations and parties to acquiring resources and improve analysis capabilities. These big data users can consider as big data community when there is a strong relationship among them and collected data from parties, flow between members as individuals or organizations. However, because of the complexity of big data cannot use traditional way for manage data, and in specific knowledge sharing as transferring knowledge to the authorized user in real time (Abdullah, 2008), so, firms have been developed different infrastructure to interact with big data user. Knowledge grid as communication infrastructure can provide a foundation for exchanging huge among of data and information efficiently (Wang *et al.*, 2006). It designed for implementing data mining services and applications involving resource management to provides a system for describing, publish information from data sources, computing resources and data mining algorithms (Cesario *et al.*, 2007). It provides required services to cooperative teamwork for problem-solving and decision making.

Users are the main component of any community, thus, in big data community big data users as individual or organization playing an important role. While there is a lack of research focusing on community members' roles and influence on the communication platform such as knowledge grid.

This study tried to clear big data users' behavior impact on the knowledge grid by considering the role in big data analysis and its connections to knowledge grid component. Moreover, it analyses users' behavior and expectation of knowledge grid system and their effect on the grid system.

2. Literature Review

The research reviewed several resources on the connection of big data and knowledge grid, the knowledge sharing in knowledge grid infrastructure and narrows it target user to data scientist which have been explained in the following.

2.1. Knowledge Grid and Big Data Community

In a collaborative environment, such as big data community a group of users work with each other's and share their knowledge and resources in order to reach the common target (Abdullah, 2008). Because of big data complexity, a suitable platform to connect resources is essential, thus, knowledge grid suggested, as grid-based architecture which designed to handle problems involving the huge amount of data (Cesario *et al.*, 2007) and supports distributing knowledge and linking resources into the grid (Zhuge H., 2002). Communication and interaction between users from different backgrounds are fundamental features of big data community so facilitating knowledge exchanging between users while recognizing and sharing valuable information among increasing rate of data, flow and distribute it between users at real-time will be challenging (Hosseinioun S. A. R. h. *et al.,* 2018b). Knowledge grid as advanced infrastructure attempted to use in extensive resource environment and integrating

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higher-level services. This makes applications to adjust with dynamically and various changing computing environment easier, more reliable and cheaper regardless to location (Zhuge H. S. X., 2016). Knowledge resources in big data community as grid nodes and the semantic connection between them include grid network as grid links are main components of knowledge grid which has direct interaction with users whom are big data generators and define the semantic relation between knowledge (Hosseinioun S., A. R. h. *et al.*, 2018a).

2.2. Knowledge Grid and Knowledge Sharing

Knowledge as actionable information should be managed accurately to be more valuable and meaningful (Abdullah, 2008) to be able to answer the questions and improve productivity and services. Since the last decade because of advanced and sophisticated software and faster hardware, network and computing performance increased significantly and they used to develop high-performance computing systems, called clusters, to solve resource intensive problems in several application domains. On the other hand, these systems are incapable of the handling of processing huge amount of data at the real-time by the traditional ways (Hosseinioun S. A. R. h. *et al.*, 2018b). Thus, to deal with the challenge of data managing include processing, access, and distribution, a computational infrastructure is essential. Grid computing developed for distributing the variety of resources as high-speed network, supercomputers, and clusters to solve the problems involve large scale data. It also provides an opportunity for organizations that to reduce the capital and operating cost of its computing resources while maintaining the computing capabilities it requires. This is because the computing resources of most organizations are vastly underutilized, but are necessary for certain operations (Chandhini C, 2013).

2.3. Targeted Users

Users have a significant role in big data system and their behavior directly affect generating and using of big data (Zhuge H. S. X., 2016). Lin T.C. (2012) claimed that users or community members' expectation behavior of the system lead to many analysis factors of knowledge sharing services. These also cover the characteristics which give the pleasure in helping people and the intention and reliability level of member's knowledge sharing (Chen J, 2010). However, in big data community the velocity of data need to understand and it's difficult to routinize the work and embed the use (Janssen and Wahyudi, 2017) and in this situation data scientist should handle the Big Data challenges in the way to bring structure for large quantities of formless data and make analysis possible (Davenport and J., 2012). Thus they responsibility is to discover knowledge to cover the requirements and provide the answer for the defined problem. Most of the researches on Big Data and Data Science have been focused on Data Mining, Statistics, even ontologies, etc. which decently provide useful instruments to benefit from Big Data. But should consider that many of this field only focus on knowledge discovery while no such thing like a discovery engine that automatically locates and distills all kinds of information (Englmeier and F., 2017). In addition, redundancy is very common time and cost wasting in the journey of formulizing and find variable knowledge in big data chaos, so collaborative platform which motivates knowledge experts to share their experiences, skills, and resources is necessary (Hosseinioun S., A. R. h. *et al.*, 2018a).

3. User Influence on Knowledge Grid Components

Knowledge grid provides an application environment for users to capture share knowledge sources effectively. Zhuge H. (2004) argued, two ways for capturing knowledge on the knowledge grid. The first method is that users obtain knowledge directly from published recourses by other users, while in the other method knowledge obtain from different resources such as text and image by mining and synthesizing (Zhuge H., 2004). The component made a knowledge system are human being, books, documents, patents and copyrights, computer information systems as well as working solutions, community of practice and webs of relationships, while they might have embedded in the products and services. Thus, the structure of the knowledge system is like a network system which made of a set of other networks. Must consider that nodes in this system will be any documents, models, individuals and even organizations which are critical for any activity or organization process in the system. On the other hand, connections and coordinating mechanisms, such as knowledge flow or workflow will consider as links. Often knowledge storage mistakenly has been assumed as nodes and place of knowledge creation, but actually, knowledge creation happens on the links. As the links represent the knowledge process, as information flows across the links, new knowledge is created both at the nodes and on the links, which can be then applied to meet the needs of the organization (Hengshan, 2005). Zhung defined a human layer in his knowledge grid architecture model which reflect the knowledge grid's social and human behavior characteristics. It includes "knowledge space"containing explicit knowledge from all participating human users, "user space"containing user information, the "society and organization rules", and a viewpoint of social value for evaluation. Humans use natural language to convey explicit knowledge in certain media, such as text files, so, knowledge grid might require users to provide an attachment of background knowledge, and common sense that current media omits. During all this process must consider the knowledge should extract from big data.

4. Results and Discussion

Knowledge sharing and collaboration among the community which involves a variety of organizations, departments or individual user found crucial for using big data; and in particular, working together proved the importance of data scientists or big data analysis experts. The research categorized and described it finding of big data community members influence factors from individual aspects and organizational aspect in Table1.

Table-1. Big Data Community Factors From People and Organization Aspect

Related Study	People Aspect	Organization Aspect
(Janssen and Wahyudi, 2017)	• Analytic Skills • Organization Relationship	• Top Management Support • Resource Collaboration Rules
(Wamba *et al.*, 2017)	• Technical knowledge • Technology management • Business knowledge • Relational knowledge	• Planning • Investment • Coordination • Control
(D. and I., 2015; Dutta D., 2015)	• Business Knowledge • Technical Knowledge	• Collaboration Strategy • Top Management Involvement
(Gupta, 2016)	• Managerial Skills • Technical Skills	• Resource Management • Managerial Commitment

As Table1 represented, the listed factor directly impacts data analysis and knowledge flow among any knowledge system include knowledge grid. Zhuge in his knowledge grid architecture model expressed human layer in direct contact with semantic layer includes "knowledge representation space" which represent machine understandable form of users' knowledge. It also contains "role subspace" where depend on users' intention they play versatile roles and "Requirement subspace" to express users' requirements. This layer won't allow users to interact directly with the resource layer so they shouldn't worry about resources place and structure. On the other hand, their technical knowledge and skill will be significant so this layer can remain as the communication platform. Moreover, organizations and the individual can play as grid nodes they involvement in network effect directly the size and density of the nodes while their collaboration strategy and rules administrate the knowledge flow among community members. So, the density of grid nodes increases by user interest and tendency to specific area as big data generators and their understanding and expectation create and define the semantic links and connection in the grid. Because of most of the knowledge flow in the system are involve organizations, their limitation, rules, and strategy of knowledge publication affect collaboration in the community.

In final covering community members' requirement and expectation from the knowledge sharing system is the goal. Thus, user satisfaction act as evaluation variable for measuring the level of success in a distribution system. The study reviewed several knowledge sharing models by considering user role in several communities which are similar to big data community and summarized the influence factors in knowledge sharing in Table 2.

Table-2. Factor Influence Knowledge Sharing

Author	Factor	Focus	Result
(Siemsen *et al.*, 2008)	• Motivation • Ability • Opportunity	Organization employees	Improve knowledge sharing behaviors
(Chena *et al.*, 2013)	• Knowledge Differentiation • Knowledge Location • Knowledge Credibility	Open source software project teams	Facilitate Knowledge Sharing and Communication Quality
(Chen J, 2010)	• Norm of Reciprocity • Interpersonal Trust • Knowledge Sharing Self-Efficacy • Perceived Relative Advantage • Perceived Compatibility	Professional virtual communities	Knowledge contributing and collecting behaviors
(Alali H, 2013)	• Knowledge quality • System Quality • Service Quality • Perceived Usefulness • Perceived Ease of Use	Healthcare sector in virtual communities	Improve knowledge sharing behavior
(Zheng and Stylianou, 2013)	• Perceived Information quality • Perceived system quality	Virtual Communities	Continuance intention to consume and continuance intention to provide
(Chiu *et al.*, 2006)	• Social Interaction • Ties • Trust • Norm of • Reciprocity • Identification • Shared Language • Shared Vision	Virtual Communities	Quantity of Knowledge Sharing and Knowledge Quality

As Table 2 illustrated, the quality of knowledge is one of the important factors to motivate members of using the system and fulfill their expectation, but sharing knowledge between organizational entities require the clear agreement of transferring and trust building between parties where top management support is necessary. Also, it is crucial to protect the distributed knowledge from unauthorized modifying in the path and it must have received only to authorized users. Therefore, authentication of who is allowed to have access to the knowledge will controls by Grid Security Infrastructure, protecting knowledge in network by adopting several methods such as encryption and replication (Esposito and Palmieri, 2014).

From another point of view, all the factors lead to the user satisfaction of the system such as easy to use also can lead to increase the quantity of using the system which grows the number of community members, knowledge flow and in other word increase the quantity and density of nodes and links.

5. Conclusion

This study aimed to discover big data community members on knowledge grid as a platform for knowledge sharing. To achieve its goal, it analyses the individual users and organization role in big data analysis and connected them to main components of the grid system, nodes, and links. The result shows the targeted users, data sciences knowledge and organizations strategy effect directly on the level of their participation in the community which leads to the nodes density and links. Also, research found out the users' expectation factors from a knowledge sharing system which revealed the quality of knowledge is the key of user satisfaction of the system is dependent on link strength. The follow up research activity will be analyzing Technological factors for a knowledge grid as communication foundation for knowledge sharing, to design a comprehensive knowledge grid model among big data community.

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