

Enabling a Meta-synthetic Discovery Workshop for Social Consensus Process

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Abstract

Knowledge growth is always achieved through a consensus process of debates and discussions for imaginations, inquiry, insight and integrity. Various academic conferences play vital roles during such a consensus process. Currently, digital revolutions are happening to scholarly communication. In this paper, we propose a concept of a meta-synthetic discovery workshop for the social consensus process during scientific knowledge change and delivery process. Supporting technologies such as conferencing mining are briefly discussed to enable that concept workable, especially to help push augmented information to actors during that process.

1. Introduction

Science discovery brings rich knowledge toward the whole world. How does it happen at the current time? The Canadian philosopher and psychologist Professor Paul Thagard regards scientific knowledge growth as a complex system and proposes an integrative framework which is composed of three kinds of processes - psychological process of discovery and acceptance, physical process involving instruments and experiments, and social process of collaboration, communication, and consensus that brought about the transformation in scientific knowledge [1]. It is impressive of his study on the social aspects of scientific understanding and the collaborative process of research, consensus building, and even the validity of information on the Internet.

In reality, academic conferences are one of most usual and then efficient social ways to exchange understandings directly, acquire fresh ideas and expand social networks among scientific communities. In recent years, dramatic increase happens to either the number or the scale of events for social process in both academic and industrial worlds, and digital revolutions contributes much. Conference management systems

greatly improve the organizing efficiency with electronic processing of a variety of interactions among program chairs, local organizers, paper authors and paper reviewers. Besides, advanced services such as ubiquitous computing technologies have been exploited to facilitate participants' communications during the conferences since the late 1980s [2, 3].

In this paper, we observe and study those endeavors of information supporting services from systemic view using meta-synthesis system approach. The concept of meta-synthetic discovery workshop for social process is proposed to call for integration of those information supporting services. Along with the discussion, an example of conference mining is taken to show the meta-synthetic support by iView analysis, a technology to implement qualitative meta-synthesis. Firstly we review meta-synthesis system approach briefly.

2. Meta-synthesis system approach and its exercising platform

In March of 2008, Professor Ben Schneiderman pointed out that traditional scientific methods need to be expanded to deal with complex issues that arise as social systems meet technological innovation and proposed Science 2.0 to call for new ways of studying those integrated interdisciplinary problems at the heart of sociotechnical systems [4]. Actually the vision toward the disadvantages of reductionism in dealing with those unstructured messy problems had been already existed since 1970s.

2.1 Meta-synthesis system approach and HWMSE

Along the system rethinking tide aroused in the end of 1970s, limitations of mathematical modeling to unstructured messy problems had been gradually realized and emerging approaches were proposed. In parallel to many western schools of the explorations, some new system approaches were forwarded based on

comparisons between western and eastern system thoughts by oriental system scientists. Proposed by a Chinese system scientist Qian Xuesen (Tsien HsueShen) and his colleagues, meta-synthesis system approach (MSA) is one of those approaches to tackle with the most complex system - open complex giant system (OCGS) problems from the view of systems in 1990 [5]. An understanding of MSA is simplified as from confident qualitative hypothesis to rigorous quantitative validation, which reflects a general process of knowing and doing in epistemology. Later Qian proposed a concept - Hall of Workshop for Meta-Synthetic Engineering (HWMSE) as a platform for MSA practicing [6]. The concept of HWMSE reflects the emphasis of utilization of the breaking advances in information technologies to show to harness the *collective knowledge* and *creativity* of diverse technical group experts by synthesizing data, information, models, knowledge, experiences into interdisciplinary problem-solving process for both proposing hypothesis and quantitative validating. We may regard HWMSE is an advanced state of a decision support system (DSS) while humans are elements of HWMSE and play primary roles even machine systems (traditional DSS) can provide intensive support.

Obviously HWMSE is oriented to problem solving under a group or community scale. Either divergent and convergent process happens during a group working process and may yield qualitative hypothesis where after divergent idea generation, some creative understandings or concepts will be acquired to develop scenarios or perspectives for further studies; or may be final validated knowledge. HWMSE expects to provide whole support for such a problem structuring and solving process. For unknown or new issues, new knowledge is often needed for a practical solution. Creative solutions often refer to wisdom. Then HWMSE is expected to enable knowledge creation and wisdom emergence.

2.2 HWMSE as a knowledge creating and transfer *ba*

In 1995, a Japanese professor Ikujiro Nonaka proposed the theory about organizational knowledge creation where he emphasized the role of a right *ba* (a Japanese word) during knowledge creation process [7]. *Ba* is defined as a platform where knowledge is created, shared and exploited; the most important aspect of *ba* is *interaction*. The knowledge-creating process is also the process of creating *ba*, which means to create a boundary of new interaction [8].

The name of HWMSE absorbs ideas from academic seminars, war-gaming and many similar activities of group discussion and debates. However, it seems an awkward term and hampers its understanding. Considering the basic ideas of HWMSE, we think HWMSE can be a right *ba* for idea generation and wisdom emergence for creative solutions of the complex issues [9]. Table 1 lists some functions of HWMSE which may be achieved via the 4 different *ba*'s during the knowledge conversion process. The 1st column of Table 1 lists the activities related to different types of meta-synthesis; those activities may be carried out at different *ba*'s to enable knowledge conversion by using the methods or resources listed in Column 3. The last column gives the possible supporting tools which can be elements of HWMSE. Ref. [9] gave detailed explanations. The construction of a HWMSE is then to develop supporting tools listed in Column 4 and have them integrated to fulfill those tasks or activities listed in Column 1. The baseline is to support community or group work.

Scientific knowledge growth is a process of knowledge discovery fulfilled by scientific communities. Next we present a concept of applying HWMSE to the facilitation of the social process.

Table 1. Activities in HWMSE based on Ba [9]

Activities	<i>Ba</i>	Methods and Resources	Supporting Tools
Idea generation; confident hypothesizing; wisdom emergence	Originating Ba	Brainstorming, soft OR methods	BBS, socialware, communityware, creativityware
Concept formulation, knowledge creating, scenario generation	Dialoguing Ba	Soft OR methods, problem structuring methods, KJ method, Delphi method, etc.	Creativityware, collaborationware, groupware, communityware, consensusware,
Rigorous validation (qualitative-quantitative meta-synthesis)	Systematizing Ba	Domain modeling methods, analytical methods,	Modelware, groupware
Meta-synthesis from qualitative knowledge to quantitative understanding	Exercising Ba	Consensus methods (nominal group technique, analytical hierarchy process, voting, etc.)	Modelware, consensusware, collaborationware

3. Meta-synthetic Discovery Workshop for Social Consensus Process

HWMSE is composed of three systems, human expert system, machine system and knowledge system [6]. MSA itself aims to take the advantages of both human beings (experts) in qualitative intelligence and machine system in quantitative intelligence to generate new or validated knowledge which is stored into a conceptual knowledge system. When exploring MSA to the scientific knowledge growth, we try to develop a HWMSE for three processes of knowledge growth. For unknown or new issues, we always call for new ideas, which may come from human's imaginary thinking, inquiry, intuition and insight. With supporting tools, especially creativity software, sparkling ideas may drop into one's mind. Social process provides platforms for knowledge sharing and association. Take academic conferences for example. Generally publications, conference rooms and auxiliary equipments are basic physical elements. Versatile organizing ways are soft elements for better communication among participants. The organizers always engage in facilitating the emergence of a nice *ba* for various dynamic academic and social exchanges. OLCB is a concept to reflect such kind of human facilitation activities and related integrative supporting tools [10].

3.1. On-line conferencing *ba*

If for facilitation of communication and information sharing among conference participants, OLCB can be any combinations of communityware, creativityware and collaborationware which drive for further scientific collaboration and knowledge creation. Besides basic data collected via conference management system, conference mining technologies are explored to acquire more information from the submissions and push to the participants for awareness of some senses [10, 11]. Ref. [12] gives a practical application to an international conference on knowledge science to show from the collective ideas contributed by all accepted papers to generate a rough vision of knowledge science studies.

Actually people can use a search engine to get *urls* to what they want to know. They can also browse *wikipedia* to get more detailed information. Various e-Science facilities provide specialized search engines for the retrieval of academic resources (such as journal articles) about the relevant disciplines. If regarding the scientific knowledge discovery as an unstructured problem, how to get some constructs of the concerned disciplines? Replies to the following questions are

always expected. What are the major research topics? Who are the principal investigators? Which conferences are flagships conferences? Where and when to hold the influential conferences? etc. The OLCB is therefore needed to be expanded to all scientific communities. Then we apply HWMSE and expect to build a workshop on meta-synthetic engineering for the focused disciplines. If still limited to social process, we concentrate on the concept of meta-synthetic discovery workshop.

3.2. A workshop on meta-synthetic discovery for social process – extension of OLCB

Internet is such a giant knowledge system, whose knowledge comes from contributions of millions of users enabled by the emerging Web technologies. Currently many studies have been done to deal with information-explosion and next generation search. Microsoft has already launched out into building an infrastructure to provide large-scale data processing and data management capabilities. WebStudio, an infrastructure is being constructed to facilitate the development and experimentation with new data mining algorithms for improving Web search [13]. On the other side, social networking sites, wikis, blogs and other bionic software ^[14] are to enable collective intelligence from on-line opinions. Those infrastructure and advanced technologies, especially Web 2.0 technologies enhance the machine system of original OLCB during knowledge growing process.

It is more convenient for people to access huge academic resources. The scope of a topic can be quickly acquired. Misconducts such as plagiarism may easily either happen or be found, and then interventions may also be easily taken at both technological and social sides. Actually the enhanced machine system provides meta-synthetic support for social consensus process and fosters the emergence of a meta-synthetic *ba* for active and trustworthy interactions, especially more widely gets empathic feedbacks and critical comments, which are helpful for knowledge transfer and creation. Studies have to be undertaken about Web 2.0's impact on scholarly communication [15].

Social impacts are worth concerns; here we concentrate more on technologies. In next section, an application of conference mining is given to show the qualitative meta-synthetic support for understanding a topic. The topic is meta-synthesis, which is still not familiar to most communities in system science and engineering field.

4. Applying conference mining to meta-synthetic discovery workshop for social process

Instead of using powerful deep search, we show how to detect more interesting information about the concerned topics just from those accepted submissions from the dedicated academic conferences. Here iView analysis is applied to the *International Workshop on Meta-synthesis and Complex System* to show how to understand the research of meta-synthesis. The iView technology aims to conduct qualitative meta-synthesis for hypothesis or scenario for further studies [15]. It

applies graph theory and social network analysis methods to the iView network which is usually composed of a pair of networks: idea map (a keyword network) and human map (keyword sharing network) based on paper information [12, 16].

The 7th International Workshop on Meta-synthesis and Complex System (MCS'2007) belongs to the serial workshop MCS workshop which is held every year since 2001. Figure 1 & 2 are the pair of iView networks of MCS'2007, which was held in Beijing in the end of May of 2007 and finally accepted 32 papers under an acceptance rate lower than 25%. Figure 2 is generated by new version of iView tool using C#.

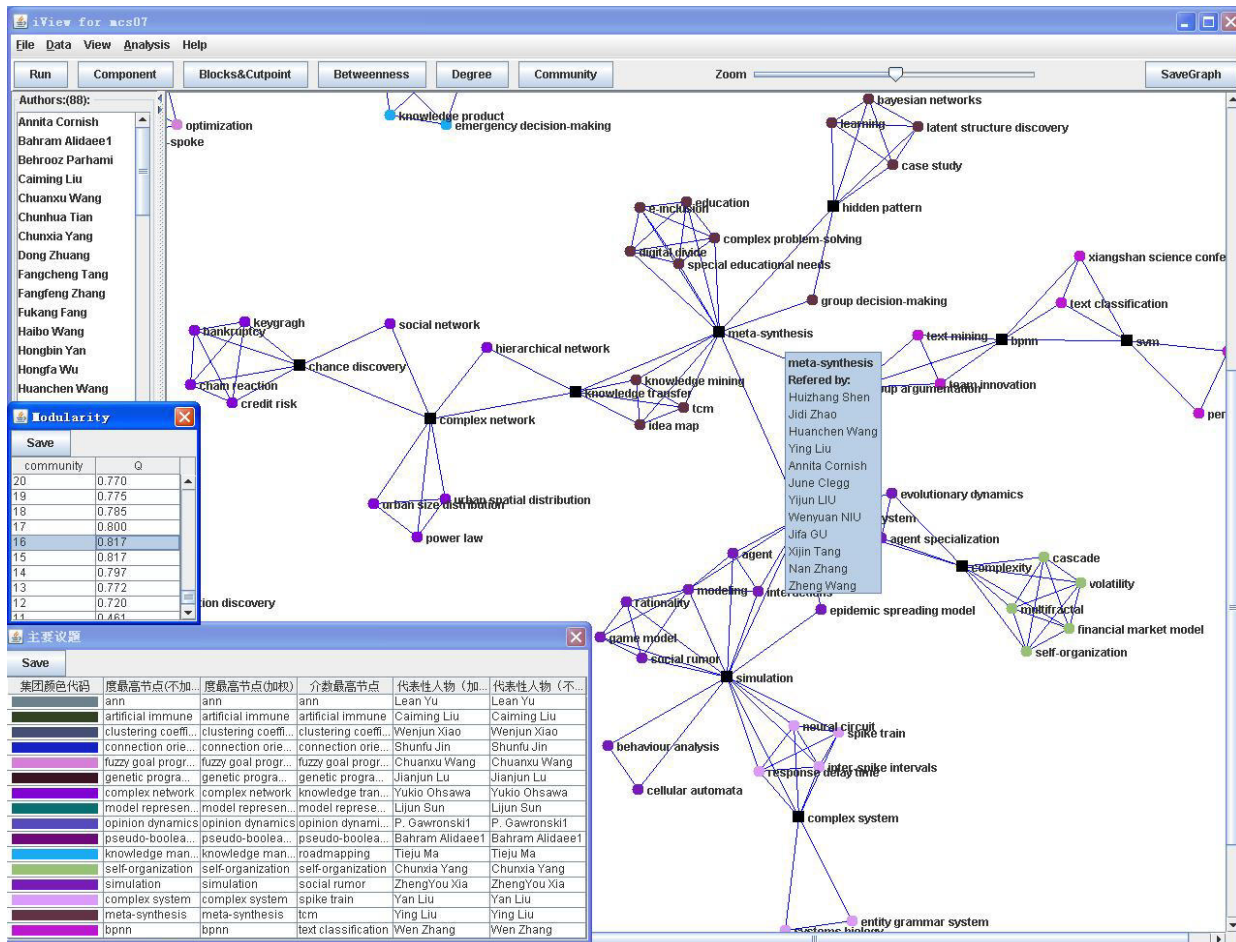


Figure 1. iView's idea map of MCS'2007 (keyword network; black square node: cutpoint)

In the iView's idea map of MCS'2007, we find 13 cutpoints, *meta-synthesis*, *group argumentation*, *multi-agent system*, *hidden pattern*, *BPNN*, *knowledge management*, *simulation*, *complexity*, *complex system*, *SVM*, *knowledge transfer*, *complex network* and *chance discovery*, which may be constructs in meta-synthesis studies. 16 clusters (nodes with different colors) are

detected based on Newman fast algorithm for community clustering [17]. In the iView's human net, we find 15 clusters. Centrality analysis will further help to find more information. Only by simple analysis, such as cutpoint analysis, a new comer or bystander can quickly know the main topics in meta-synthesis research, the collective scenario contributed by those authors. All those results were published at the OLCB

of MCS'2007 before the convening date to help participants find potential interesting people or talks. Actually the iView network of one conference only reflects participants' understandings at that year. For

more comprehensive scenario of meta-synthesis study, it is better to retrospect past workshops to trace the change of the research foci.

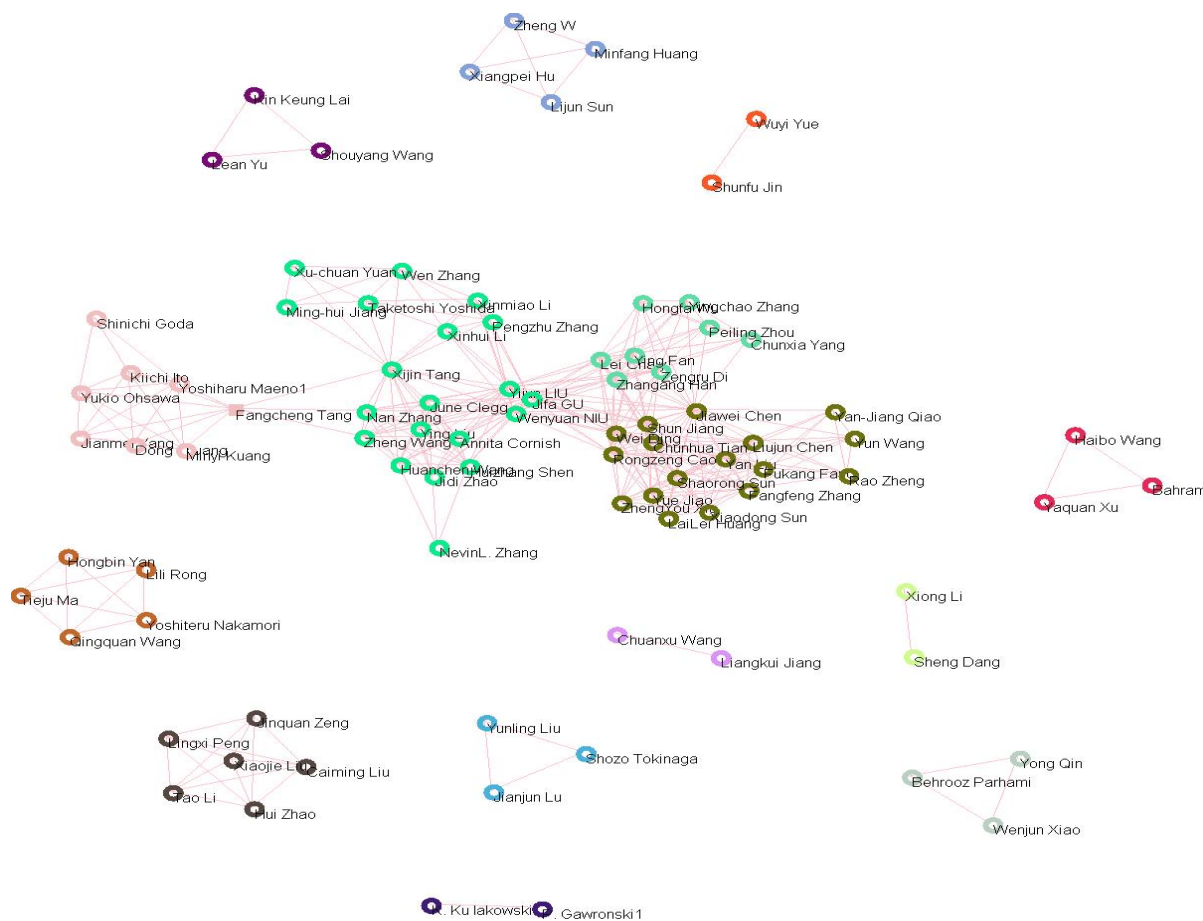


Figure 2. iView's human net of MCS'2007 (keyword-sharing network, a social network)

As above mentioned, such a technology provides some hints for new association. Such analytical ways are expected to be integrated into the meta-synthetic discovery workshop for augmented search. However, that is not the end to help social consensus process of meta-synthesis studies. The modelware as is listed in Table 1 as a tool to support exercising *ba*. It is better to provide interactive ways to help users experience those computational results directly using the authors' methods and datasets, and also serves another kind of consensus process to validate those achievements. By that point, meta-synthesis from qualitative hypothesis to quantitative validation may be achieved.

5. Concluding remarks

Knowledge growth is a complex system and always achieved through a consensus process of debates and discussions for imaginations, inquiry, insight and integrity. The social process of communication, collaboration and consensus is added into the integrative framework of scientific knowledge change proposed by Professor Thagard. Various academic conferences play vital roles during such a consensus process. Moreover, science-related portals have been developing to provide extensive information or links to the relevant disciplines. Further evolution of those portals launches on-line global services, such as pushing latest news, journal issues, research achievements or a variety of news headlines to the subscribers via emails, e.g. IEEE on-line global services or EurekAlert of the American Association for the Advancement of Science. Programs to facilitate

sciences research such as e-Science have been undertaking for global collaborations in key areas of science. Web and text mining technologies are widely used to improve the efficiency of human information processing. Huge endeavors are being made to provide versatile help to all three processes in scientific knowledge growth. Digital revolutions are happening to scholarly communication.

In this paper, we apply meta-synthesis system approach to the complex system and propose a concept of a meta-synthetic discovery workshop for the social consensus process from systemic standpoint. Facing so many cutting-edge technologies in e-science or Internet field, we try to use that concept to call for more advanced analytical technologies to enable the emergence of knowledge creating *ba*. We also briefly show how iView analysis, one kind of conference mining technologies, is applied to one academic workshop to understand more about meta-synthesis study itself. Even the iView analysis provides macro view toward meta-synthesis research, it is expected to pay attention to enabling modelware to provide micro level vision, such as the interactive modeling process of MSA application, to help people know more psychological aspect of the original contributors' ideas and then return back more empathetic comments for the social consensus.

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