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Emergence of collective intelligence in online communities☆

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ABSTRACT

The main focus of this study is on the scientific identification of preconditions for collective intelligence (CI) to emerge and the prediction of possible development scenarios based on qualitative research results. The research subject is online communities that use innovative social technologies encouraging collective decision making, creativity, entrepreneurship and cooperation. The research treats such platforms of indirect communication as environments for the development of CI. The qualitative content analysis aims at exploring similarities, differences, and relations between interview segments and the theoretical framework for CI Potential Index. Qualitative research allows to deepen the understanding of CI and specifies a further direction for theoretical and empirical research. The research conclusions lead to the re-design and alteration of the proposed methodological framework for CI Potential Index.

1. Introduction

The growing significance of Web 2.0/3.0, social networks, wikis, and other collaborative technologies in helping individuals and groups to share knowledge through collective platforms is a great source for organizational intellectual capital and "could help human communities evolve their collective capabilities in an unprecedented way" (Lykourentzou, Vergados, Kapetanios, & Loumos, 2011, p.217). The Collective Intelligence (CI) approach is a fundamentally different perspective to how applications can support human interaction and decision-making. Relevant research efforts from various disciplines focus on the growing role of online collaborative communities in the cooperation emerging through online communities. However, little research focuses on knowledge management techniques in civil society structures, most of which adapt and use such software in their activities and project that software in the form of online communities. Lettieri, Borga, and Savoldelli (2004) outline several causes of status quo in this research field. First, they emphasize the highly diverse, unstable nature of manageable data. Second, the authors state that civil society structures do not prioritize knowledge management in their activities. Researchers present significant results in identifying the potential of CI to solve various societal problems in modeling CI from a conceptual point of view (Luo, Xia, Yoshida, & Wang, 2009), but according to Lykourentzou et al. (2011, p.219) they do not focus on an essential issue: "CI system design and optimization processes, through which CI will be able to emerge in a systemic manner."

Section 2 introduces the theoretical framework for a CI Index and a set of criteria for measuring CI in online communities. The methodology for the CI Potential Index calculation allows the analysis, evaluation, and assessment of significant changes in CI systems and builds on a predefined questionnaire, automatic data collection, and their algorithmic analysis. The proposed methodology will be empirically tested and adjusted according to the results of quantitative research, qualitative research and experiment. This study presents and discusses the results of a qualitative research study.

2. Toward theoretical framework for measuring CI

According to Lykourentzou (2011, p.224) online communities, although different in functionality, "seem to share some basic common attributes and provide the potential for the design of a general methodology that will allow the systematic development and optimization of CI systems."

The design of the CI Potential Index focuses on the creation of a framework for the evaluation of online community projects and the identification of potential cases, which could become effective CI systems. A theoretical literature analysis sets the basis for the design of an adequate and empirically tested framework (detailed results appear in Skaržauskienė, Pitrėnaitė-Žilėnienė, Leichteris, Paunksnienė, & Mačiulienė, 2014). This analysis leads to the identification of three dimensions crucial for the CI potential: capacity, emergence and social

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maturity. Fig. 1 illustrates the conceptual framework for the analysis of the CI potential in the environment of social technologies.

2.1. Capacity dimension

Capacity dimension relates to actions and qualities of individual users resulting in massive interaction and development of new knowledge and competencies. Diversity in the source of ideas (Page, 2007) is the basic feature of successful collaboration initiatives because demographic, educational, or cultural diversity creates value-adding groups, organizations and societies due to access to different types of skills, talents, competencies, etc. Constant flow of fresh new ideas ensured by the dynamism, openness and flexibility (Luo et al., 2009) of online initiatives allows more freedom of joining and leaving the community due to the vague boundaries of such structures. Openness of online communities also contributes to the formation of 'critical mass' of contributors within the community to reach a 'swarm effect' (Lykourentzou et al., 2011) which is essential for a higher level of intellectual capabilities to emerge. Knowledge aggregation, knowledge transmission and fusion (Lesser, Ransom, Shah, & Pulver, 2012) processes ensure the capacity to manage a constant flow of distributed knowledge of individuals located inside and outside online structures, allowing linking knowledge to knowledge by capturing relevant information and developing the knowledge networks. Intelligent usage of high amounts of information and stored knowledge, and independence (i.e., limited influence by the decisions of others) (Norvaišas et al., 2011) ensures adequate decision support and leads to effective decision-making and problem solving (Goyal & Akhilesh, 2007) practices as well as development of new ideas, prototypes, competencies, and activities (Yu, Nickerson, & Sakamoto, 2012).

2.2. Emergence dimension

The emergence dimension relates to the state of CI systems, which may have self-organization, adaptivity, and emergence of synergy as main characteristics. Self-organization (Schut, 2010) of CI crowds relies on equal rules of how to participate, enabling horizontal, egalitarian structures. Distributed memory systems (Luo et al., 2009)—shared mental models residing in members' minds—enable cognitive processes and facilitate collaboration and communication. Another important element is task, which refers to the benefit that the community aims at when using the CI system. Even if the design of a CI system is optimal, that system will lack collective capabilities if the target community does not use it. Hence, online structures must implement appropriate motivation (Malone, Laubacher, & Dellarocas, 2010) mechanisms. Support of knowledge management by social technologies leads to the 'wisdom of crowd' effect (Salminen, 2014), meaning that communities usually present higher-level intelligent capabilities compared to individual members. In order to be effective, online structures need to ensure adequate levels of transparency to create trust between community and society (i.e. *transparency and trust*) (Prahalad & Ramaswamy, 2004). Online structures must also be able to change according to changes in the environment (i.e., adaptivity) (Schut, 2010) and ensure security and privacy (Joinson & Paine, 2009) to protect data and knowledge from interference by third parties.

2.3. Social maturity dimension

The social maturity dimension relates to individual and community goals and their development in online communities. Social maturity considers the culture and the value for society (Boder, 2006) of the organization which augment human cognition and promote intellectual growth. Social problems monitoring (identification) (Malone et al., 2010) allows the identification of needs and opportunities for social innovation. This dimension includes a sustainability element (Skaržauskienė, Mačiulienė, & Pitrėnaitė-Žilėnienė, 2013); that is, the continuous impact of online infrastructures.

In summary, the potential for CI is a relational conception that defines capacity of an online community for aggregating and creating knowledge, creativity and decision-making, and the ability for self-organizing, adaptivity, and the emergence of the swarm effect, as well

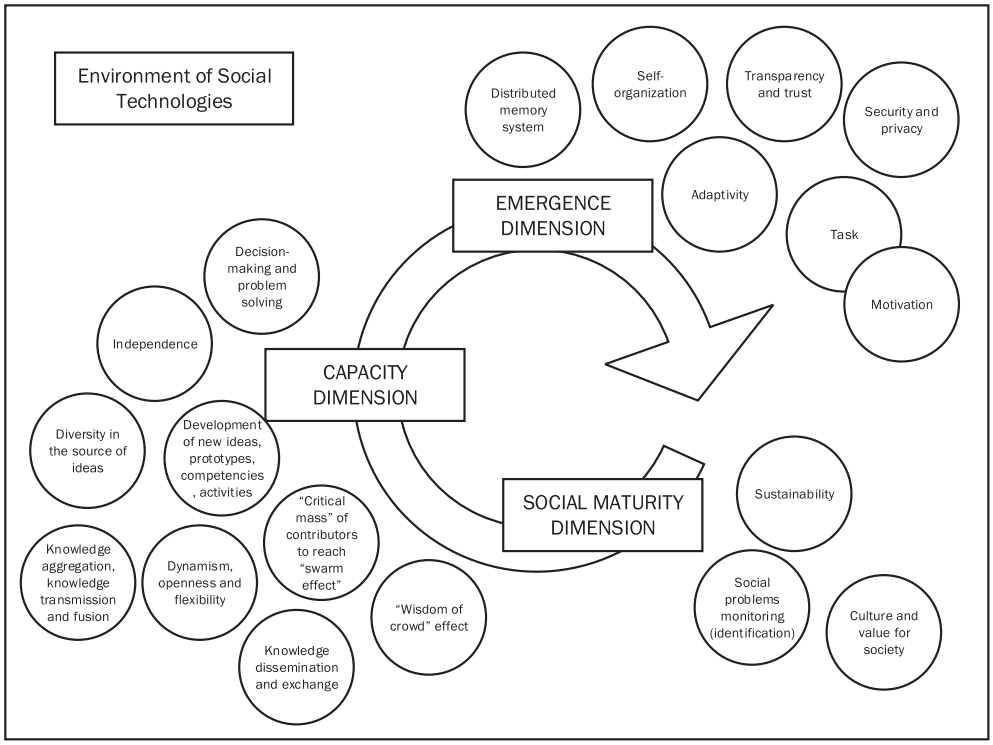

Fig. 1. Conceptual framework for analysis of CI potential.

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