Collective Intelligence Monitoring Technique

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1. INTRODUCTION

The main focus of this conceptual paper is not on a self-expedient analysis of collective intelligence (CI) as a phenomenon, but on the scientific identification of preconditions for collective intelligence to emerge, the enunciation of holistic conceptions, the prediction of possible development scenarios and the collection of empirical data on the value of collective intelligence for society. Many researchers have presented significant results in identifying the potential of collective intelligence to solve various societal problems or in modelling CI from a conceptual point of view (Luo et al, 2009; Malone et al, 2009; Barahona et al, 2012; Salminen, 2012; Kittur et al, 2013; Prpić, 2014), but according to Lykourentzou et al (2011) they do not focus on an essential problem – "CI system design and optimization processes, through which collective intelligence will be able to emerge in a systemic manner." The present methodological approach for a Collective Intelligence Monitoring Technique is distinct in a **wide range of techniques**, preconditioned by complexity of the scientific problem and the synergy of the project team members' competences. Projects of online communities that use innovative instruments of collective decision making and mechanisms to encourage personal and collective creativity, entrepreneurship and cooperation facilitating origination of new self-governance and self-organization forms were chosen as the research subject (Skaržauskienė & Pitrenaite-Žilėnienė, 2013). Such platforms of indirect communication are treated in the **research as environments for the development of collective intelligence.** Recent research results of Engel et al (2014) show that a collective intelligence factor characterizes group performance for online groups approximately as well as for face-to-face groups.

Having assessed and integrated various approaches to CI, **criteria for a CI emergence** were identified and **hypotheses** on the impact of individual factors upon the CI potential in online communities were formulated. These hypothesis were tested in the course of quantitative research, and analyzed during the qualitative research. The respondents were chosen to include both the most active initiators of the networked platforms and present or potential members of online communities. The **quantitative research** identified the extent and trends of involvement and participation of CI development actors and other stakeholders. In order to achieve a statistical sample and the credibility of data collection procedures, services of a public opinion and market research company were used to deliver surveys of at least 1000 respondents. The quantitative research has also established the construction of the active Internet user profile and identification of the key legal risks in participation in online communities. The **qualitative research** was conducted to broaden knowledge about processes taking place during initiation and implementation of online community projects and to collect empirical data on features, singularities, stimulating factors and obstacles for collective intelligence to emerge.

The key strength of the research methodology is that the CI phenomenon is scrutinized by applying various scientific approaches to combine a range of perspectives into a systematic dynamic model of collective intelligence and develop a CI observation methodology based on the CI Potential Index calculation. The research methodology is shown schematically in Figure 1.
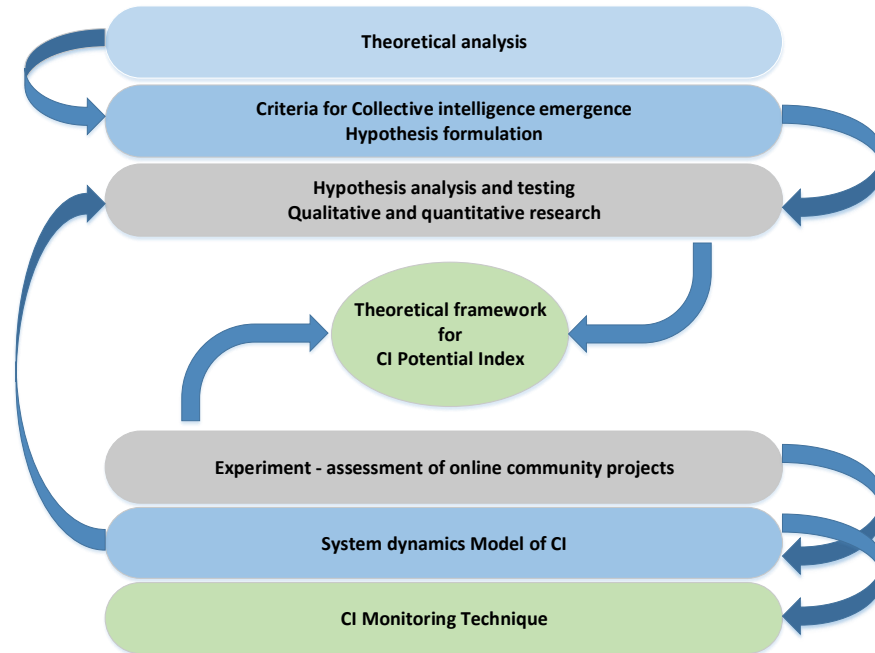
Fig.1 Research methodology for developing the CI monitoring Technique

Results of the qualitative research have complemented insights from the quantitative research and established the theoretical model of the CI Potential Index (CIPI) which was introduced at the Collective Intelligence 2014 conference at MIT, Boston by Skaržauskienė, A et al (2014). Next, the key dimensions, components and indicators of the index were identified and the indicator measurement scales were designed. The model was validated during a scientific experiment and the correlations between the variables were tested by developing a **system dynamics model (see Figure 2)**. The **scientific experiment** was launched alongside with the quantitative and qualitative research. As it was impossible to have a control group and experimental groups with identical features, quasi-experimental research methods were invoked. Selected community projects were observed in accordance with the designed survey scheme (representative parameters). A qualitative analysis of the data was summarized in several conclusions. At the onset of the experiment **(exploratory stage)** the researcher conducted a natural experiment with no direct interference into the activities of the researched online community. During the second stage, after developing the CI Potential Index methodology, the experiment went on to evaluate the CI potential in several chosen online communities (active societal community projects were already identified in the first stage of the experiment). This stage incorporated negotiations with platform developers and administrators to get access to specific *web analytics* data. Besides organizational behavioral factors, the experiment evaluated social technological tools adapted in the platform. The results of evaluation of 11 online communities (X1-X11) and general CI Potential Index of these communities are shown in Figure 3.
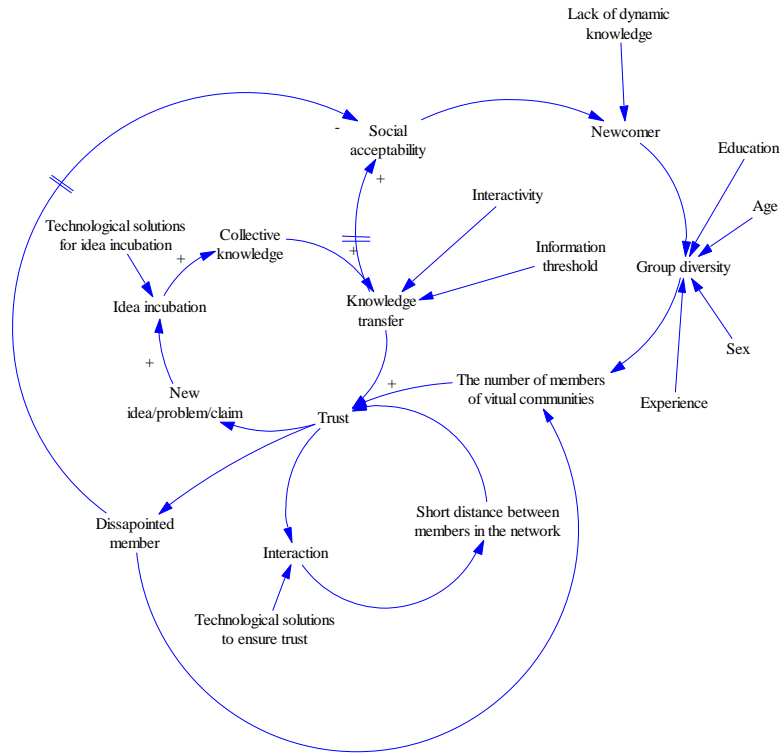
Fig.2 System dynamic model of Collective intelligence

The Collective Intelligence Monitoring Technique was developed on the basis of experimental calculations of the CI Potential Index in online communities.
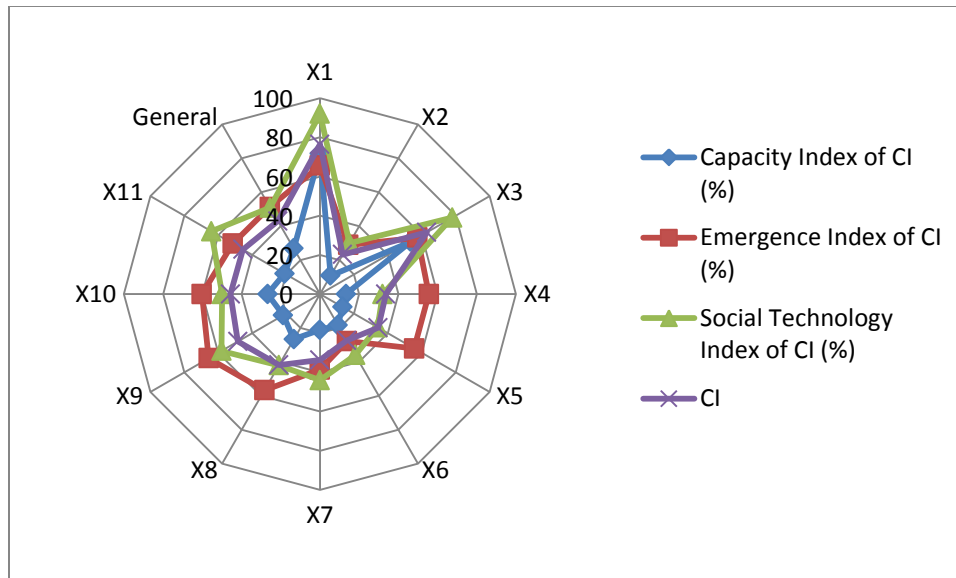

Fig.3. The results of experimental evaluation of 11 (X1-X11) online communities in Lithuania

After aggregation and normalization of the numerical data, assessments of the probability of possible deviations (e.g. insufficiency of data) were made and individual index component weights in the index calculation formula were determined. The developed methodology will be adapted for the virtual scientific environment based on automatic data storage and algorithmic data analysis. The CI Monitoring Technique will incorporate opportunities to calculate the CI Potential Index and to monitor the CI emergence and development processes in networked structures (online communities, virtual platforms etc.) by collecting empirical evidences.

REFERENCES

Barahona, M., García, Ch, Gloor, P.A. &Parraguez, P. 2012. Tracking the 2011 student-led movement in Chile through social media use, *Universidad Catolica de Chile,* MIT, Collective Intelligence 2011

Engel, D. Woolley, A. W. Jing, L. X. Chabris, C. F.& Malone, T. W. 2014. Reading the Mind in the Eyes or Reading between the Lines? Theory of Mind Predicts Collective Intelligence Equally Well Online and Face-To-Face. *PLOS ONE*, 9(12): e115212.

Kittur, A., Nickerson, J. V., Bernstein, M., Gerber, E., Shaw, A., Zimmerman, J., Lease, M. & Horton, J. 2013. The Future of Crowd Work. *Proceedings of the 2013 conference on Computer supported cooperative work*. ACM, New York, 1301–1318.

Luo, S. Xia, H. Yoshida, T.& Wang, Z. 2009. Toward Collective Intelligence of Online Communities: A Primitive Conceptual Model. *Journal of Systems Science and Systems Engineering*, 18(2): 203–221.

Lykourentzou, I, Vergados, D.J., Kapetanios, E.& Loumos, V. 2011. Collective Intelligence Systems: Classification and Modelling. *Journal of Emerging Technologies in Web Intelligence,* 3(3): 217–226.

Malone, T. W., Laubacher, R.& Dellarocas, C. 2009. Harnessing Crowds: Mapping the Genome of Collective Intelligence. *Technology, 2009-001, Cambridge, MA.*

Prpić, J.; Taeihagh, A.& Melton, J. 2014. Crowdsourcing the Policy Cycle. *Collective Intelligence 2014*, MIT Centre for Collective intelligence, Boston.

Salminen, J. 2012. Collective Intelligence in Humans: A Literature Review. *MIT, Collective Intelligence 2012.*

Skaržauskienė,A & Pitrenaite-Žilėnienė, B., 2013. Following traces of collective intelligence in Social Networks: case of Lithuania. In *Proceedings of 10th International Conference on Intellectual Capital, Knowledge Management and Organizational Learning*, 411-419

Skaržauskienė, A, Leichteris, E., Mačiulienė, M., Pitrėnaitė-Žilėnienė B. & Paunksnienė, Z. 2014 Social Technologies for Developing Collective Intelligence in Networked Society, Collective Intelligence 2014, MIT Center for Collective intelligence, Cambridge, USA

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