Collective Intelligence-based Idea Platform with Linked Data

HyeYoung Lee
Innopolis Foundation
Daejeon, Republic of Korea
helenlee@innopolis.or.kr

***Abstract*—Open innovation has been a paradigm for organizations to enhance innovation activities and create out of knowledge and expertise. Traditional open innovation model focuses on the use of external sources to develop product and services and reduce costs in terms of business strategy. To leverage flexibility of open innovation model, crowdsourcing-based idea platform concepts have emerged to cooperate, co-evolve in business ecosystem to collect ideas and convert them into innovative solutions. Crowdsourcing-based idea platform have specific limitations in idea selection and transformation as it costs lots of time and energy by building and exploiting big data framework. By applying linked data to crowdsourcing-based idea platform, this paper suggests improved collective intelligence-based idea platform by addressing how to cope with challenges of big data framework.**

Keywords—open innovation; crowdsourcing; business ecosystem; idea platform; big data; business strategy; collective intelligence

I. INTRODUCTION

Open innovation is a paradigm to utilize external ideas and innovating with partners by sharing risk and incentives [1]. Technologies like internet have escalated open innovation as tools and infrastructure by democratizing knowledge creation in cost-efficient way. Traditional open innovation model has one directed flow of external knowledge into the organization in cooperation with external stakeholders. To maximize efficiency and flexibilities of open innovation, crowdsourcing-based idea platform concepts have been emerged. Aggregating knowledge from a multitude of diverse contributors in platform enables to obtain solutions that are beyond the boundaries of established mindset [2]. It has advantages like idea variability, pool creation of high-quality ideas in types of tournament and collaboration. However, in idea selection and transformation process to generate value for solution, 'crowdsourcing' cannot work to utilize abundant ideas to evaluate the best ideas [3]. Moreover, main influence factors in idea selection and transformation for market are not defined well.

This study assumes that the key factor lies in lacking of capabilities for idea interpretation and distribution in big data framework of ideas. To improve to handle big data of ideas and transform ideas into appropriate solutions, this paper presents crowdsourcing mobilization process, combining linked data for idea interpretation and publication on platform. By using ontology technique and incorporating idea structuration, ideas can transform into rich knowledge and value by crowdsourcing. This paper excludes crowdsourcing application to involve people in the computational process for idea evaluation and development. It focuses idea generation and selection process with open linked data.

The rest of the paper is organized as follows. Section 2 presents linked data combined idea platform framework. The final section comprises implications, limitations and future research directions

II. OPEN INNOVATION: IDEA PLATOFRM

Open innovation has fundamental principles as collaboration and participation by cross-disciplinary participants. Contrary to traditional open innovation framework, crowdsourcing-based open innovation presents loose and flexible innovation mode as stakeholder groups can develop initiatives and implement ways in the framework interactively. User-driven open innovation adds value into idea platform to grow up ideas as new business model and solutions for problems. Crowdsourcing-based idea platform in open innovation supports people to engage and collaborate to collect ideas and develop ideas to resolve challenges.

The overall three types of idea platform in open innovation are summarized as follows. This paper proposes improved framework based on crowd participation of idea platform.

- Goal achievement: If goal is set in the platform, idea suggestions are posted to reach the goal. Participants can collaborate to meet the goal by communication.
- Incubation: Through reviews, selected idea is developed by mentoring and related supports for realization.
- Crowd participation: idea selection and transformation are executed by online participants in public or private channel.

Idea platform concept is driven to support to commercialize the ideas. As participants in idea platform communicate interactively, ideas are evolved in open, integrated framework. Crowd participation of idea platform can be tapped into ideation processes to create solutions or transform into commercialized innovations. To participate, collect and process ideas among participants, interactive communication continues in the framework as user-driven open innovation.

III. CROWDSOURCING

As many idea platforms have grown up and require for complex ecosystems to maintain sustainable development with quality of ideas, they have reviewed crowdsourcing to prevent risks and operate efficiently in whole process. 'Living Labs' is integrated concept with user-centered research and open innovation model to provide co-creation, exploration, experimentation and evaluation within a public-private-people partnership. It allows all stakeholders to engage highly to create new products and services and test prototype in live environments. Wise and Høgenhaven reflects user-driven innovation model by separating modes as Living Labs to collect data, recognize pattern and develop ideas in terms of user involvement [4]. User-driven innovation implies significant sources of knowledge and innovation for products and services from users. However, in area of idea platform, it has weakness because user knowledge in big data framework is complex to manipulate effectively [5]. From this perspective, collaborative participants are involved to share ideas and create solutions by aggregating crowd resources and utilizing their skills. Crowdsourcing platform as 'Crowdsourcing Landscape' addresses eight business model components of media and content, platforms, crowd services, crowd ventures, crowd process, marketplaces, non-profit and content and product markets [6]. It poses limitations of ambiguity to decide adopting strategies on considerable time and efforts, risks related to crowdsourcing initiatives with regulation, confidentiality, Hammon and Hippner pointed out that risks and issues can occur when it lacks of understanding of crowd structure or control in operation management [7]. To alleviate risks, Juhana suggests the framework to include phases of selection planning, organizing and execution in structural ways and tools with from proprietary in-house solutions to ready-made infrastructure for hire platforms and existing communities [8].

a.

IV. LINKED OPEN DATA

Linked data means that data can be exposed, shared and connected explicitly as structured data using international standard in semantic web environment (http://www.w3.org/DesignIssues/LinkedData.html).

It facilitates the derivation of knowledge from data and creates meaningful links among data to regenerate knowledge with relevant context as key component of integration scheme of big data. Linked data consists of standard Web technologies as HTTP (Hypertext Transfer Protocol), RDF (Resource Description Framework) and URI (Uniform Resource Identifier) to share and read data. According to the W3C, the Semantic Web provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries [9]. For developed knowledge management and discovery, open data applying linked data structure shares vocabulary semantics to interpret data easier and makes links to verify consistencies of data sources.

As linked open data has expanded, it becomes one of big data types. Big Data is not only 'bigness' of collected big data through sources but closer to how 'smart' to show insights that the volume of data can provide by analysis with techniques drawn from several disciplines, including statistics, computer science, applied mathematics, and economics [10]. Linked open data reduces variability of big open data by utilization of RDF and shared vocabularies in object centric terms. Developing linked open data analysis and processing models is required to coordinate and collaboration between different methods and solutions of preprocessing including the raw sensory data, various metadata, data abstraction, pattern recognition, semantic interpretation and online analytical processing methods to create insights and extract knowledge [11]. This finding highlights the potential of linked open data in area of knowledge management and discovery by providing semantic base for classification and representation of idea data.

V. CROWDSOURCING BASED IDEA PLATFORM WITH LINKED DATA

Technologies like internet enables web to play a significant role in crowdsourcing based idea platform by engaging people to share knowledge and develop ideas through online communities. Online communities have 'collective intelligence' in crowdsourcing to motivate problem-solving by mutual collaboration. Mergel provides recent examples of open government by examining open innovation approach going through four processes (1) idea creation through crowdsourcing, (2) development of ideas with collaboration and improvements (3) validation and evaluation of realization, and (4) completion of implementation [12].

'Crowd-sourced' data quality assessment can be carried out with reward and related incentives. The use of data from crowdsourcing based framework can be the standard in idea generation and selection process depending on degree of usefulness and validity. Towards higher collaborative engagement from public, crowdsourcing based data has characteristics to be relevant, more accessible and transparent. This data value chain is composed of idea generation, idea aggregation, idea distribution with open participation and collaboration framework. However, empirical and objective data driven crowdsourcing based big data framework has limitations in terms of idea selection and knowledge transformation. Also idea generation tools to catch crowdsourcing's power are not generally accessible.

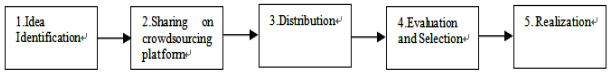

Fig. 1. Crowdsourcing based Idea Platform Process

To adapt the framework for idea selection and transformation, linked data is applicable for improvement by locating crowd data in knowledge discovery. Linked data refers to the collection of data to collect and share on the web. Berners-Lee summarized linked data rule as follows [13]:

1. Use URI as names for things
2. Use HTTP URIs so that people can look up

3. Provide useful information using the standards (RDF, SPARQL)

4. Include links to other URIs

Resource Description Framework (RDF) and Hypertext Transfer Protocol (HTTP) are main elements in the linked data as RDF provides data structure and link and HTTP makes data communicate each other. Therefore one dataset on the internet can be linked to another dataset as a web of data. To model domain objects in the internet, vocabularies are expressed in RDF and connected into related vocabularies to extend discovery of data sources.

VI. Crowd-sourcing based Idea Platform with Linked Data

To propose improved model of idea platform by combining linked data and crowdsourcing, main research objective is to develop based on public engagement in area of participatory framework. In this paper, linked data is suggested to help integration, interpretation and distribution of idea in the public open data model before decisions and action plan for idea realization. In phase of idea generation and selection process, suggested open public data model is reflected as five parts. 1) Idea collection from public in unstructured format, 2) Idea structuration with RDF linked data format, 3) Idea preprocessing and integration, 4) publication on open innovation database, 5) Knowledge mobilization.

1. Idea collection from citizen in unstructured format

- Public idea collection is completed on open innovation platform to solve problems by interactive interfaces.

2. Idea structuration with RDF linked data format

- To transform unstructured idea into structured idea, linked data with RDF, which is also machine readable, is applied for conversion to provide knowledge component before integration.

3. Idea preprocessing and integration

- Structured idea is selected, filtered, divided and integrated for semantic analysis methodologies like machine learning.

4. Interpretation and publication on open innovation database

- By analysis of hidden relationship, inter-relations, patterns based on knowledge discovery, obtained results are visualized as interpretation. And depending on decision making process, interpreted idea is classified as updated knowledge in open innovation database.

5. Crowdsourcing mobilization

- Participants can attend in knowledge mobilization which is tapped into collective intelligence. They can access to open innovation knowledge database, retrieve ideas by queries, create discussions by refereeing database and distribute issues in citizen community with cyclic movement. This cycle would be applied into idea selection for decision making process and action planning for idea realization.

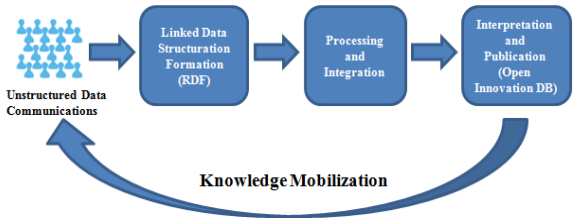

Fig. 2. Improved Crowdsourcing based Idea Platform Model

VII. Conclusion

In idea platform working process, combined approach of crowdsourcing and linked data in open innovation framework is used looking into empirical application value of linked data to structure ideas to overcome limitations of traditional idea platform. Crowdsourcing supports public ideas to transform beneficial knowledge for realization. This research examines crowdsourcing mobilization process with linked data to foster participatory idea platform and activate decision making of best idea.

Also it highlights function of linked data for crowdsourcing-based idea platform in open innovation framework. Heterogeneity linked to collective intelligence made by public becomes invaluable assets through crowdsourcing platform. However, knowledge acquisition and communications from crowd seems to change dynamically. To promote stakeholders willingness to share and develop idea platform, it needs to build transparent and collaborative environment with framework standards. This paper provides cyclic process reflected in knowledge mobilization for improved crowdsourcing-based platform with linked data. For further research, it is required to overcome limitations of unproven idea discovery in seeking out potential ideas for solutions. Additional investigation utilizing framework, as work flow and idea evaluation tools enhanced by big data analysis technologies would promote this study to point out the future directions of collective intelligence-based idea platform.

Acknowledgment

I would like to thank Prof. Ho-Jin Choi for his guidance to attend Exobrain workshop.

References

[1] Briand, L. C., Daly, J., and Wüst, J., "A unified framework for coupling measurement in objectoriented systems", IEEE Transactions on Software Engineering, 25, 1, January 1999, pp. 91-121.

[2] [1] Chesbrough and Henry William, Open Innovation: The New Imperative for Creating and Profiting from Technology. HBS Press, 2003.

[3] Natalicchio, A., Messeni Petruzzelli, A. and Garavelli, A.C., "A literature review on markets for ideas: Emerging characteristics and unanswered questions", Technovation, Vol. 34, No. 2, pp. 65-76, 2014.

[4] Wise E. & Högenhaven, C., User driven innovation context and cases in the Nordic region. Nordic Innovation Centre, 2008.

[5] Marcel Bogers & Allan Afuah & Bettina Bastian, Users as innovators: a review, critique, and future research directions. Journal of Management, 36(4), pp. 857–875, 2010.

[6] Dawson, R. & Bynghall, S., Getting Results from Crowds - The Definitive Guide to Using Crowds to Grow Your Business. 1st ed. San Fransisco: Advanced Human Technologies, 2011.

[7] Hammon, L. & Hippner, H., Crowdsourcing. Business & Information Systems Engineering, 3, pp.163-6, 2012.

[8] Juhana Laasonen, Value Creation in Crowd-Business: Developing a Framework for Successful Implementation of Crowdsourcing Initiatives, National Library of Finland, 2014.

[9] World Wide Web Consortium (W3C), "W3C Semantic Web Activity", 2011.

[10] AOM, Big Data and Management, Academy of Management Journal, Vol. 57, No. 2, pp. 321–326, 2014.

[11] Payam Barnaghi & Amit Sheth & Cory Henson, "From data to actionable knowledge: Big data challenges in the web of things", IEEE Intelligent Systems, volume:28, issue: 6, 2013.

[12] Mergel. I, Social Media Adoption: Toward a representative, Responsive. or Interactive Government?. Proceedings of the 15th Annual International Conference on Digital government Research, 2014.

[13] Berners-Lee, http://www.w3.org/DesignIssues/LinkedData.html, 2007.