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IMPLEMENTATION OF LCA DATA EXCHANGE SYSTEM: ACHIEVEMENTS AND CHALLENGES

Katsuyuki Nakano, Wataru Koike, Japan Environmental Management Association for Industry (JEMAI)*

Takuma Sugimoto, eagif

Kiyotaka Tahara, National Institute of Advanced Industrial Science and Technology (AIST)

** 2-1, Kajicho 2- chome, Chiyoda-ku, Tokyo, 101-0044. E-mail: nakano@jemai.or.jp*

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ABSTRACT

To increase reliability and sustainable growth of LCA data such as process dataset and LCA case study, there is a necessity of a number of experts' involvements and data exchange beyond organization's boundary. It must be achieved without disclosing confidential information. Therefore, we developed and released LCA data management system to address this issue. A user of the system can publish and use LCA data in the library of the central server freely. Each uploaded LCA data can be marked of their review status to show their reliability. A specific review status can be added by a user who has a specific corded reviewer key in the system. As of January 2013, dozens of LCA data are uploaded to the central server voluntarily.

INTRODUCTION

To improve reliability and sustainable growth of LCA, database involvement of a number of experts and data exchange beyond organization's boundary are needed. As infrastructure of LCA data exchange, database management systems have been developed, such as the ELCD Database developed by Joint Research Centre of European Commission and JLCA-LCA database system developed by LCA Society of Japan (JLCA). In these systems, process dataset is registered after the database management body reviews the process. There are sometimes different datasets for the same process, but the management body manages them to avoid overlap of data item. Therefore, a user is able to use the LCA data with feeling of trust. However, the immediacy is low. Timing of database revision is controlled by the management body. The openness is also low. This type of data management style is categorized by the Shonan Guidance Principles for LCA database (UNEP/SETAC Life Cycle initiative, 2011) as the Scenario L.

On the other hand, data exchange system using Peer to Peer technology was proposed (Mstafa and Wigren, 2004). Norris (2008) suggested Web-based system to which anybody can upload their calculated result. Srocka and Ciroth(2011) presented system that can upload/download LCA data to commercial software. These concepts were categorized as the Scenario I in the

Shonan Guidance. An open system, such as the Scenario I, is said that it encourages data creation activities from the bottom-up with crowd-sourcing or collective wisdom. However, reliability is relatively low. It is concerned that worthless LCA data may overflow on the central server because anyone can publish their data on the cloud. Additionally, keeping consistency among LCA data is difficult in this case.

Therefore, ensuring compatibility with reliability, consistency, immediacy, openness and user-friendless is important for data management system. To address this issue, we developed and released system as an additional function of LCA system "MiLCA" (JEMAI, 2013), and we report this solution.

METHODS

Outline of the proposed system is shown in Figure1. Procedures of data exchange and function follow.

1. A provider of the LCA data registers his/her "Team". An aim of "Team" function is to manage a data editor. Each LCA data automatically belongs to a team of a data creator, and a user who is in the same team can edit this data. A team ID and password is required to join the team, so an origin of LCA data can be managed by this function in the system. If LCA data is published on the MiLCA Library without team registration, anybody can modify it. It is able to be used this function like "Wikipedia".
2. A LCA data provider produces a unit process dataset and may link to upstream processes. In this system, process-based inter-linked inventory database "IDEA" including about 3000 datasets (Tahara et al, 2008) is installed as a default database.
3. Each LCA data can be marked of their review status. A specific review status can be added by a user who has a specific corded reviewer key. We issue this key for a person who passed the LCA expert examination (Institute of LCA, Japan and JEMAI, 2013) or the LCA Certified Professional examination (American Center for Life Cycle Assessmen, 2013).
4. A LCA data provider may convert their LCA data to calculated data using the default IDEA database for keeping a secret of intermediate flows.
5. The created LCA data is exported based on ISO TS 14048 format.
6. A provider uploads LCA data to the MiLCA library in the central server freely by using Application Programming Interface (API). To avoid unintended disclosure of LCA data, a provider can upload LCA data only belonging to their team. For example, it should be avoided a provider uploads LCA data reported from their supplier without a permission of them.
7. A user may utilize filtering function based on a review status as shown in Figure 2 if a user prefers to find a relatively-reliable LCA data.
8. Downloaded data is imported to LCA software MiLCA and used for a user's LCA study.

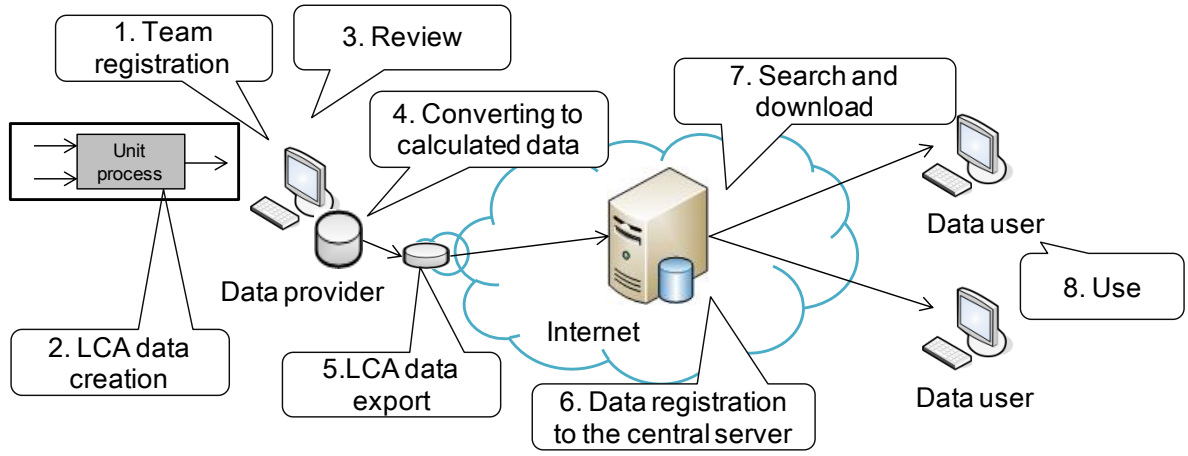

Figure 1. Outline of the proposed LCA data management system

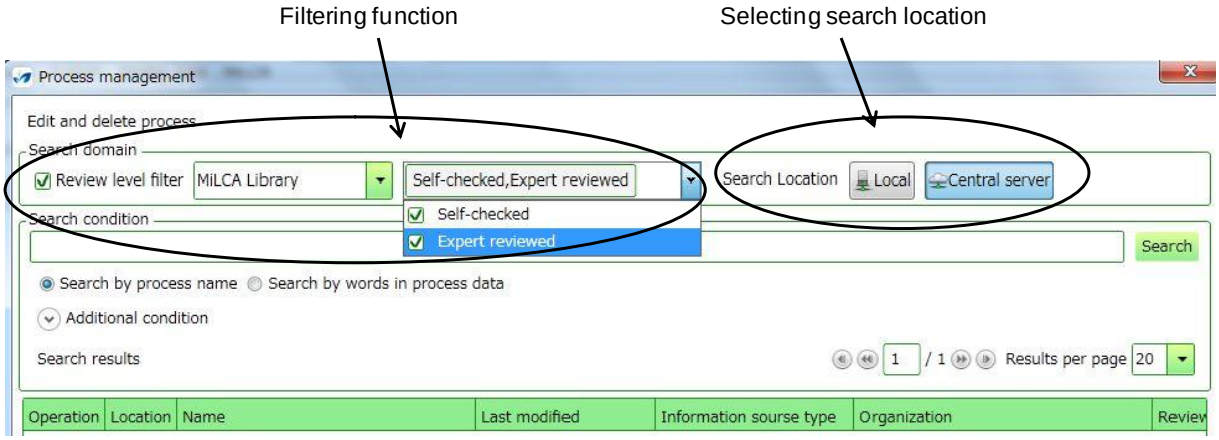

Figure 2. Search Outline of the proposed LCA data management system

RESULTS AND DISCUSSION

These functions were implemented and released as the default functions of MiLCA. The Team function prevents from unintended modifications of published LCA data. To support keeping consistency among LCA data, the existing LCA software and LCI database are used as infrastructures. The Review function clarifies reliability of each LCA data, and a user may utilize it for distinguishing a quality of the data. As of May 2013, dozens of LCA data are uploaded to the central server voluntarily. As seen above, an infrastructure for encouraging LCA data exchange among LCA practitioners is made. However, following issues still exist.

-Good-governance of default database and library: a default database is used as background database for published LCA data, so continues improvement of the data quality is essential. Incentives for publishing LCA data are needed. Furthermore, an appropriate standard to select “best available data” from a number of datasets expressing same process are required.

-Copyright protection and clarification of various contributions: keeping the right of a first unit process data producer is important, but a lot of third parties' contributions, such as pointing out a mistake, linking to upstream processes and review, are also precious contribution to the LCA community. These contributions must be clarified and respected.

-Revision of calculated data: when the default database is updated, a calculated dataset also must be revised. However, revision of published calculated data must be done by the original data provider. If the data is already distributed in long supply chain, updating all data and keeping consistency is a challenge.

-Security: as same with internet bulletin board system (BBS), surveillance of published data is needed.

CONCLUSIONS

We designed and released data management system ensuring compatibility with reliability and openness. However, there are still a lot of issues remained, such as producing good-governance body of the data management system and incentives for contributing the system.

REFERENCES

American Center for Life Cycle Assessmen (2013). LCA Certified Professionals http://lcacenter.org/1certification.aspx <viewed 2013-5-23>

ILCAJ and JEMAI (2013). LCA Expert Examination. http://www.biz.jemai.or.jp/lca-kentei/ (In Japanese) <viewed 2013-5-23>

JEMAI (2013). LCA software MiLCA. http://www.milca-milca.net/english/ <viewed 2013-5-23>

Mstafa, M. and Wigren, P. (2004) . Secure XML file sharing in a JXTA P2P network for inter-organizational industrial collaboration. *Master's Thesis of Computer Science and Engineering Program*, Chalmers University of Technology, Gothenburg.

Norris, G. (2008): Earthster, an Open Life Cycle Inventory Database, presentation, *Life Cycle Assessment VIII* Seattle, USA, 30 Sep – 2 Oct.

Srocka, M., Ciroth, A. (2011). Web-based exchange of LCA data from the client side perspective, presentation, *EnviroInfo 2011* Ispra, Italy, 5 - 7 Oct.

Tahara, K., Kobayashi, K., Onoue, T., Kanzaki, M., Nakano, K. (2008). Development of Inventory Database IDEA based on Process Analysis. *Proceedings of the 8th International Conference on EcoBalance*, Tokyo, Japan

UNEP/SETAC Life Cycle Initiative (2011). Chapter 7 Outlook: Future Scenarios for Knowledge Management. *In Global Guidance Principles for Life Cycle Assessment Databases* (pp. 113-124). United Nations Environment Programme