Presenting a Framework for Knowledge Management within a Web Enabled Living Lab

Lizette de Jager† and Albertus AK Buitendag ‡ and Potjie (JS) van der Walt ‡

†*Tshwane University of Technology, Department of Computer Science, South Africa, Pretoria.*
dejagerL(at)tut.ac.za
‡ *Tshwane University of Technology, Department of Computer Science, South Africa, Pretoria.*
buitendagAAK(at)tut.ac.za
‡*Tshwane University of Technology, Department of Computer Science, South Africa, Pretoria.*
vanderwaltJS(at)tut.ac.za

Abstract: *The current successes and true impact of the Living Lab (LL) approach in the development of new innovative ideas, products, solutions and knowledge is only now being realized in many, communities, coun- tries and continents. Web enabled Living Labs allow for the amalgamation of various networks intra and extra- nets including the social web, and helps to realize the general Living Lab objectives of being real life col- laborative development platforms. This paper will pre- sent a framework for the knowledge management (KM) process within a Living Lab environment, and highlight the role that the social web plays, in the gathering, clas- sification, and verification of knowledge generated from internal and external sources.*

Keywords: *Collaboration, Integration, Living labs, Knowledge management, Social networks.*

I. INTRODUCTION

LLs as environments for the innovative collaborative knowledge discovery are only realized in recent research papers. As part of ongoing research done based on agricultural knowledge driven Communities of Practice (CoP) within the Southern African context the following web enabled LL framework is depicted in Fig. 1, presented by Buitendag and van der Walt (2009), as well as Van der Walt et. al. (2009).

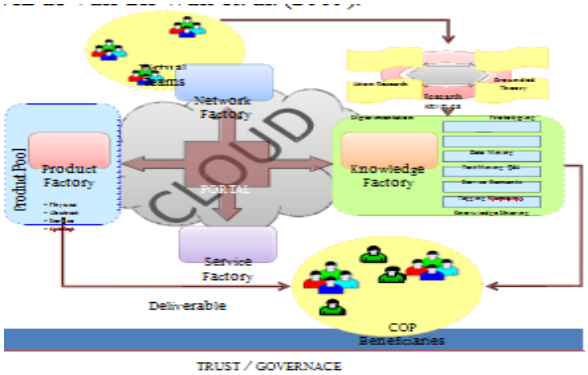

Figure 1. Web enabled Living Lab Framework

Figure 1 highlights various research methodologies to be incorporated as part of the knowledge discovery process which leads to innovative solutions and services. The processes as well as other collaborative knowledge activities have the potential to generate vast quantities of knowledge within the internal and external domains, and necessitate unique KM strategies.

Corporate KM within itself cannot come to live without making use of the correct tools to contribute, collaborate and integrate. The Internet provides social media tools for optimal KM functionality. Knowledge assets of the organization should be managed in such a way as to meet the organizational objectives. Dieng (2002) stressed that "organizational memory aims to deliver the right knowledge to the right person at the right time in the right format to enable the right action." To bring this concept to live, the correct tools must be used. The Internet provides all these tools which make such an operational platform possible.

The Internet provides for knowledge integration and brings forth a working system inside cloud computing. Social net- working is in fact a social media site where people get connected with businesses or individuals with similar interests.

II. INTRANET, INTERNET AND LIVING LAB

An Intranet can exploit an internal corporate memory whereas external memory can rely on an extranets that connect the company and selected partners. These partners can include customers, suppliers, and subcontractors. Quite a number of members in an organization use the Internet to create and reuse organizational memory. Corporate memory creation and evolution can be distributed or centralized. Distributed corporate memory supports cooperation and knowledge sharing between numerous people in an organization even if they are geographically dispersed.

Qualman from Socialnomics (2010) found that over fifty percent of the World's Population is under the age of thirty, therefore it is predicted that social media is on the rise. LLs for KM allow the end users to take part in the knowledge sharing and knowledge banking drive. LLs provide the ability to see the bigger picture and provide insight about strategic and behavioural KM efforts. The KM drivers slot in perfectly with social

media platforms and allows for seamless operation in a LL.

III. LIVING LABS, THINKING PROCESSES AND KNOWLEDGE MANAGEMENT

The LL is only a tool used within a cloud, but this tool makes integration, collaboration and optimization possible. Pallot (2006) defines a "Living Lab" as an "innovation platform" that engages all stakeholders such as end-users, researchers, industrialists, policy makers, and so on at the earlier stage of the innovation process. The value in KM systems lies in the way the knowledge is derived and applied after being captured. LLs assisted in transferring knowledge between various role players or groups. Social media accentuated the principle of social networking (Wahlroos, 2010). The web is the platform for the most creative minds in the world.

Applied knowledge in LLs means to turn knowledge into action. No knowledge becomes dormant, but is shared so that newer knowledge on the shared aspect can be captured.

KM involves connecting people with people, and people with information. Technology can speed up the strategic decision making by making knowledge available through databases, Intranets, virtual video conferencing, knowledge repositories, and collaborative tools for knowledge sharing (Fotache, 2000).

A. Thinking process as part of a LL environment

The main objective of any Community oriented LL cre- ate prosperous communities. The purpose of a LL is to support core research capabilities and shared understanding in order to learn and understand the thinking processes (Van der Walt and Thompson, 2009).

Thinking is a process of figuring things out, knowing why and how things work or doesn't work. A LL can be seen as thinking and rethinking support environments, connected to generic decision making (intelligence, design, choice and implementation) and action research (sense learn, act) processes.

B. Social Media and Knowledge Management

The success of social media depends on meeting the right online users in the right setting with the right message. According to Reichental et. al. (2007), KM, which is broadly defined as the identification, retention, effective use, and retirement of institutional insight, has been an elusive goal for most large organizations. The emergence and impact of social media in organizations force the rethinking of KM and creates completely new challenges. Today, some of the core issues with existing KM approaches can be categorized as behavioural and technical. In order for a KM system to have value, employees must contribute knowledge regularly.

Figure 2 as constructed by the researchers is an adaptation from Melakoski (2007) and Roux et. al. (2008) and depicts some Social media (Web 2.0) tools which could be included for use as part of the LL environment. Figure 2 also highlights their strengths, weaknesses, and possible relation to knowledge generation.

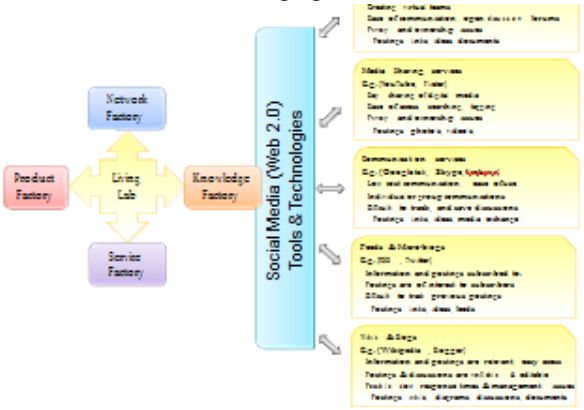

Figure 2. Examples of Social Media (Web 2.0) tools and technologies as part of a LL.

Incorporating all possible social media tools within a LL environment is not suggested, but the focus of the LL should determine which tools are best suited for their intended purpose. The number of social tools included will have an impact on the KM strategies and approach to be followed. The researchers support the notions of Reichental et. al. (2007), when it was stated that: It's likely that social-media-driven KM will require much less of the "management" component.

C. Grounded Theory and Knowledge Discovery

The GT research methodology is highlighted as one of the primary research activities within the LL domain for knowledge discovery. The GT method provides guidelines for data collection, analysis and inductive theory building. Data collection and analysis is performed in successive steps (Charmaz, 2000).

IV. KNOWLEDGE INTERCHANGE AND MANAGEMENT PROCESS

The network factory as well as the knowledge factory as part of the framework provides tools for communication and information dissemination which we refer to as Knowledge Interchange (KI).

The following KM researchers, Groff and Jones (2003) and Malhotra (2000), identified Information Technology (IT) capabilities that positively contribute to the absorptive KM in an organization:

Knowledge acquisition capability – IT's capability to identify, obtain and maintain useful knowledge from multiple sources;

Knowledge distribution capability - IT can distribute knowledge to knowledge consumers;

Knowledge identification capability – IT's function to effectively retrieve stored knowledge in knowledge repositories. Also IT's capability to identify the source of expertise;

Knowledge upgrade capability - IT can effectively upgrade knowledge and drop irrelevant knowledge;

The KI activities and processes closely correlates to the KM processes as well as knowledge sharing as de-

scribed by Hall and Paradice (2004). KI is seen as the process where information and knowledge from various sources e.g. other users, experts and the semantic web are classified, verified and stored in a data store such as a data mart, semantic knowledge base or digital library.

Figure 3 depicts the KI process, as part of the Knowledge factory in the LL framework. It highlights the fact that continuous feedback and verification of information and knowledge are achieved throughout all the phases by utilizing knowledge workers as part of each of the KI phases. As adaptations and new classifications on current knowledge objects are done, the various knowledge factory data stores are also kept up to date.

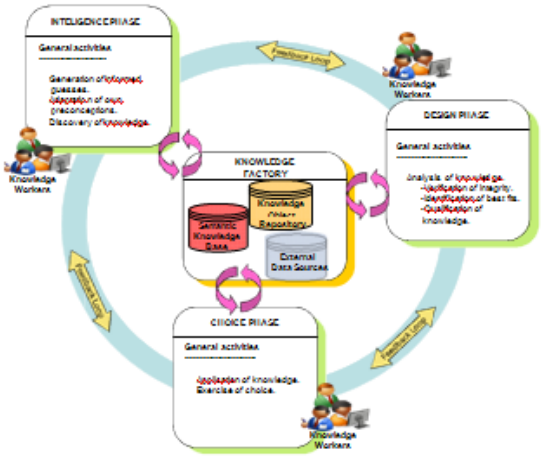

Figure 3. Knowledge Interchange.

Organizations take advantage of the most popular Internet services which include e-mail and the Web itself. The Web is used as a basis for uniform information distribution. Knowledge flow relies on populating knowledge elements on the Web. Users can access all types of knowledge, information and news archives over the Internet

Valued knowledge can be used to create differential advantage and it can also affect an institution's ability to stay ahead of its competitors. Stewart (1997) defines the data-to-wisdom hierarchy as follows: "one man's knowledge is another man's data".

Within a LL, critical operational and strategic management are often more concerned with report generation, as this documentation supports good decision making. Therefore, management's strategy will determine what the IT system should be capable off.

Sophisticated IT does not guarantee successful KM.

V. GUIDELINES FOR GOOD KNOWLEDGE MANAGEMENT PRACTICES

According to David Skyrme Associates (2008), KM manages its related processes of creation, organization, dissemination and utilization in order to meet the business objectives.

There is a wide variety of KM practices and processes, applicable in a LL environment; the table below highlights some of these practices.

Table 1. A variety of KM practices and processes.

Creating and Discovering	Creativity Techniques Data and Text Mining Environmental Scanning Knowledge Elicitation Business Simulation Content Analysis
Sharing and Learning	Communities of Practice Learning Networks Sharing Best Practice Structured Dialogue Cross Functional Teams
Organizing and Managing	Knowledge Centres Expertise Profiling Knowledge Mapping Information Audits Information Resources Management Measuring Intellectual Capital

Another good KM practice is to measure activities which focus on the specific KM practices that were applied in the project or process to determine the effect. With activity measurement specific things are looked at as to how often users access, contribute to, or use the knowledge resources and practices set up (Mavodza, 2010).

Guidelines for good KM practices include the understanding of KM, knowledge generation, acquisition and capturing of knowledge, retention and organization, dissemination and re-use, as well as responsiveness to the new knowledge (Mavodza, 2010).

VI. SOCIAL MEDIA TOOLS AND THE INTERNET

Facebook, MySpace, and Twitter are "the big three" in social networking. The researchers believe that a targeted approach should be taken when making use of social media websites based on demographics. With reference to Fig. 1 and Fig. 3 these social spaces play a significant role as sources and enablers of the network and knowledge factories. These tools are freely available and the only expenses would be Internet up-time and website maintenance. These tools are recognized worldwide and are the most popular social media platforms as they are easy to use. These tools support knowledge distribution between organizations and various CoP members internally and externally, and provides for expertise models. Community social websites intend to design a common platform for an intended purpose. Making use of the Internet as a social tool for KM, information circulation will improve among individuals, groups and within organizations, and innovation will spur. Internet social tools allow for knowledge to be accessed, shared and reused.

Figure 4 as constructed by the researchers shows the role of the Internet which include the cloud and Intra-

nets in the LL memory management cycle. The cycle and process conforms to the practice as described by Davidson 2002)

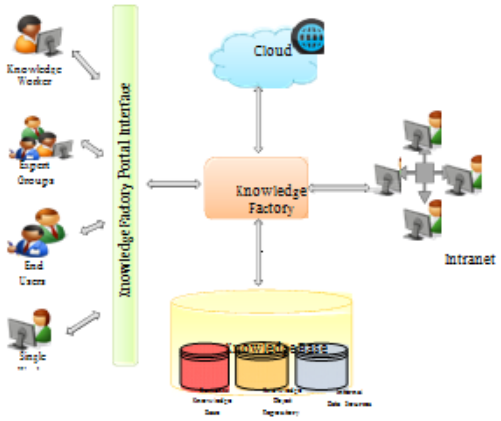

Figure 4. Position of the Internet and Intranet within a LL as knowledge sources.

Figure 4, highlights the fact that human knowledge sources such as experts, normal end users, as well as single workers from within the LL environment must be made explicit and available within the organizational memory. The knowledge are stored and managed within the Knowledge base, also referred to from a corporate perspective as the corporate memory base. Normal users which include knowledge seekers must have easy access to the various memory elements and knowledge objects and they must be able to reuse these elements and objects in order to fulfil their knowledge requirements. Figure 4 also highlights the fact the supervision and management of the LL memory environment or knowledge base, is done in a collaborative process, ensuring the continued verification of the various knowledge stores.

A. Collaboration software on the Internet

Social media enhance organizational KM by promoting ease of use, practical results, and emotional gratification within collaboration systems. Social media makes it easy for people to connect with the people who posted specific items with a single click. Social media enhance a team's collaborative performance without reengineering their current KM systems. Social media means to get connected, and KM cannot survive without connecting to the groups with the same area of interest. Being connected is all about people, knowledge and opportunities.

The question however remains: have KM and collaboration scaled in proportion to the volume of information available and could this information be useful if more people could get their hands on it (Wilson, 2010)

VII. LIVING LAB KNOWLEDGE MANAGE- MENT FRAMEWORK

The LL framework as depicted in Fig. 1 incorporates various factories as previously described. Knowledge support is an activity rendered as part of the Knowledge Factory. Various users and tools such as Web 2.0 are all possible sources of data and knowledge. The Knowledge Factory comprise of three key systems: which in itself are build up of various services in order to fulfil its intended user communities knowledge needs, the ser- vices include a KM system, a learning system and a Knowledge support service.

IIX. CONCLUSION

In today's knowledge driven economy it is required for companies, teams which includes CoP, to work smarter and not harder. With the advent of open source technologies gaining momentum (based upon open standards), now more than ever, companies and organizations must tap from existing technologies in order to prevent reinventing the wheel. Why not incorporate current successful technologies, which are freely avail- able, into the CoP to create valuable products, services and knowledge systems. Social media completely changes the existing KM paradigm. Social media takes knowledge and makes it highly iterative; where in the old world order knowledge was usually created and stored as a point in time. Cooperation and interactivity between people situated in different physical locations has never before been this easy.

We believe that knowledge support services (such as a semantic Q&A service) as depicted as part of the KM framework will become a key deliverable in the devel- opment of any information driven portal which is to

form part of any LL. From a South African perspective such services can play a critical role in limiting and overcoming obstacles such as information poverty and knowledge deprivation. The objectives, use and advan- tages of knowledge support services are not limited only to the agricultural domain but apply to any knowl- edge/information driven environment.

REFERENCES

Buitendag, A.A.K. & Van der Walt, J.S. (2007). A Question and Answer *Knowledge- sharing system* to support emergent farmers in Southern Africa. [Online] Available at: www.efita.net/apps/ accesbase. Accessed 20 May 2011

Buitendag, A.A.K. & Van der Walt, J.S. (2009). *Knowl- edge Support in a Living Lab environment though the utilisation of Web 2.0 and Web 3.0 technologies* in Proceedings of the 11th Annual Conference On World Wide Web Applications [Online] Available at: http://www.zaw3.co.za. Accessed 16 May 2011

Charmaz, K. (2000) *Grounded Theory*: Objectivist and Constructivist Methods, in Denzin, N. and Lincoln, Y. (Eds.), The Handbook of Qualitative Research, (vol.2), Sage Publications, NY, 509-535.

David Skyrme Associates. (2008). *Resources – KM Ba- sics*. [Online] Available at: http://www.skyrme. com/resource/kmbasics.htm. Accessed 20 May 2011.

Davidson, A.L. (2002). *Grounded Theory – Defined* [Online] Available at: http://www.essortment.com/

all/groundedtheory_rmnf.htm. Accessed 09 Janu- ary 2009.
Dieng, R. (2000). *Corporate Knowledge Management through Intranet and Internet*. Web Technologies. ERCIM News no. 41. Issue 3, 14-17.
Fotache D. (2000). Groupware – metode, tehnici si tehnologii pentru grupurile de lucru, Editura Poli- rom, Iasi, in Romanian. (methods, techniques and technology working groups, Polirom, Iasi, Roma- nian.)
Hall, D.J. & Paradice, D. (2004) *Philosophical founda- tions for a learning-oriented knowledge manage- ment system for decision support*. [Online] Avail- able at: http://www.sciencedirect.com. Accessed 28 February 2009.
Malhotra, Y. (2000). *Knowledge Management for E-Business Performance*: Advancing Information-Strategy to Internet Time, Information Strategy: The Executive's Journal Vol.16 no. 4/2000, 5-16.
Mavodza, J. (2010). *Knowledge Management Practices and the role of an academic library in a changing information environment*. Doctor of Literature and Philosophy. University of South Africa, Pretoria.
Melakoski (2007) ”Himottaa, mutta pelottaa” Suomal-aisen sisältötuotantoalan näkemyksiä osallistumis-taloudesta ja sosiaalisesta mediasta. Tampereen ammat-tikorkeakoulun julkaisu, Tampere. ("the Finnish content production sector views on partici-pation in the economy and social media. Tampere University of Applied Sciences publication (2007))
Pallot, M. (2006). *Living Labs*. [Online] Available at: www.ami-communities.eu. Accessed 10 July 2009.
Qualman E. (2010). *Socialnomics*. *World of Mouth*. Available at http://www.socialnomics.net/2010/04/13/over-50-of-the-worlds-population-is-under-30-social-media-on-the-rise/. Accessed 03May 2011.
Reichental Y, Gamliela, T. & Ayalb, N. (2007). Inter-generational Educational Encounters: Part 1: *A Model of Knowledge*. Volume 33, Issue 1, 1 – 22.
Roux, L., Buitendag, A.A.K. & Van der Walt, J.S. (2008). *Investigating Web 2.0 as a platform for a collaborative Living Lab environment* in Proceed- ings of the 10th Annual Conference On World Wide Web Applications. [Online] Available at: http://www.zaw3.co.za. Accessed 19 May 2011.
Stewart, T.A. (1997). *Intellectual capital*: the new wealth of organisations. London: Nicholas Brealey, 69.
Van der Walt, J.S. & Thompson W.J. (2009). *Virtual Living Lab* for Quality Assurance of meat e- markets for Emergent Farmers in South Africa. wwwza Conference.
Wahlroos, J.K. (2010). *Social Media as a form of Or-ganizational Knowledge Sharing*. A case study on employee participation. 7-14.