Adoption of Agent-mediated Knowledge Management to Increase Social Presence in Digital Community

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ABSTRACT

As we move towards knowledge-based economy, Malaysia has put forward the digital community initiative by implementing massive open online courses (MOOC). Despite the hype, this massive interconnected community depends heavily on the interaction and willingness of the members, especially the knowledge experts, to actively contribute knowledge, respond to communication requests and be committed in the digital environment. Lack of response would lead to disconnectedness of members within the community, which would lead to the failure of the whole initiative. Social presence is important to avoid this from happening, and the adoption of intelligent software agents could help in increasing this. This paper looks into how intelligent agents could be adopted within the environment of digital community, in particularly MOOC, and proposes a conceptual idea on this. More research is expected from this paper to further deploy the agents in a simulated environment of the MOOC.

Keywords: Digital community, MOOC, social presence, personal knowledge management, software agent.

I   INTRODUCTION

Malaysia is currently moving from a production-based economy to a knowledge-based economy, and while information technology (IT) is the basic tool in achieving the knowledge-based economy, the main effort lies on the society. Among the initiatives by the Malaysian government to build the digital community and knowledge-based workforce include the use of IT as a tool for more pervasive teaching and learning, and to promote lifelong learning system so that the community would be able to upgrade their skills and knowledge.

Massive open online courses (MOOCs) provides an opportunity to obtain new knowledge in large open networks. It is a recent addition of a knowledge sharing platform that integrates the connectivity of social networking, the facilitation of experts in their fields and access to online resources. Originally meant for offering courses online, the one-stop centre for resources concept could also be used for digital communities. The MOOC concept is open, where people may participate at their own rate and comfort,

within the specific area of knowledge. From a theoretical perspective, this creates a form of "legitimate peripheral participation" which allows individuals to be drawn into the community (McAuley et al., 2010). In a much broader framework, it allows large numbers of people who might otherwise be excluded to participate due to time limitations, geographical locations and other constraints. In all these dimensions, successful participation in a MOOC parallels successful participation in the larger digital community and knowledge-based economy.

In MOOC, the advantage of having an expert facilitator to reach massive number of people could also be its drawback. The self-defined nature of the MOOC capitalises on the strengths that individuals participate and collaborate to bring in their experiences, knowledge and skills to the platform. From an online communication's theoretical perspective, the participation in a digital community is largely supported by 'social presence', which determines the degree to which collaborative partners perceive each other, moderates the communication that focuses on the socioemotional communication and maintains the groups' wellbeing (Carabajal, LaPointe, & Gunawardena, 2003). In the digital community environment, social presence is explained by Garrison, Anderson and Archer (2003) as how much the participants are able to project themselves affectively within a medium. The absence of prompt feedback and replies in an online environment (Kaur & Sidhu, 2010) lead to the problems in terms of lacking interactions, and the feeling of loneliness and apprehension among the digital communities (Ellis & Anderson, 2011; Dzakiria & Idrus, 2003), which in turn decreases the social presence within the digital community. When the environment is lacking in social presence, the sharing of knowledge between participants decreases and leads to disconnected feelings among group members (Garrison, Cleveland-Innes & Fung, 2010). Hence, social presence becomes an important element in the digital community, with the challenge of conducting a suitable degree of contacts and interactions among participants (Aragon, 2003; Palloff & Pratt, 2005).

With the situation in hand, there is a need for an agent-mediated personal knowledge management (PKM), where agents can reside in the MOOC environment to mediate the tasks of the expert facilitators on behalf of their human counterparts

(Mackness, Mak & Williams, 2010). The main purpose is to enable the digital community participate better having an 'agent' to react or respond to their status. The purpose of this paper is to propose an idea of having software agents to mediate the tasks of the MOOC experts, by performing PKM processes at agent level. In doing so, the questions that need to be answered are:

- How could software agents mediate the tasks of responding to the communities' activities in MOOC?

- How software agents could increase the social presence of digital community?

- How social presence affects the participation in MOOC?

II   RELATED WORKS

In reviewing the related works, this section is divided into three parts, covering the digital community in study (i.e. the MOOC), social presence, and personal knowledge management.

A. Massive Open Online Course (MOOC)

A MOOC (Massive Open Online Course) is a platform for online courses with the option of free and open registration, with a publicly shared resources. MOOCs integrate social networking, accessible online resources, and are facilitated by the experts in the respective fields. Most significantly, MOOCs are built on the engagement of the community who self-organises their participation according to their own goals and common interests (McAuley et al., 2010).

In Malaysia, MOOC is predominantly offered on open-learning platform after Malaysia MOOCs Program was launched by the Ministry of Higher Education Malaysia in 2014. With 'Globalised Online Learning' being the key part of the Malaysian Higher Education Blueprint 2015-2025, Malaysia has became the first country in the world to implement a nationwide strategy that integrates MOOCs with on-campus university classes.

The community-based structure of MOOCs largely depends on the social networks of personal knowledge, where the users may retrieve the information, integrate and synthesise the information into new context, and share it with others. The main characteristics of MOOC, such as autonomy, diversity, openness and connectedness or interactivity (Mackness, Mak & Williams, 2010) support the creation of the digital community. Although originally meant for teaching and learning, the digital community concept could be beneficial to businesses, organisations and government agencies as well. The one-stop-centre concept to obtain the information, complemented with the connectedness among the community provides direct communication from the organisation to their target users. The direct online communication in MOOC platform can be used to create awareness and obtain feedback from the community.

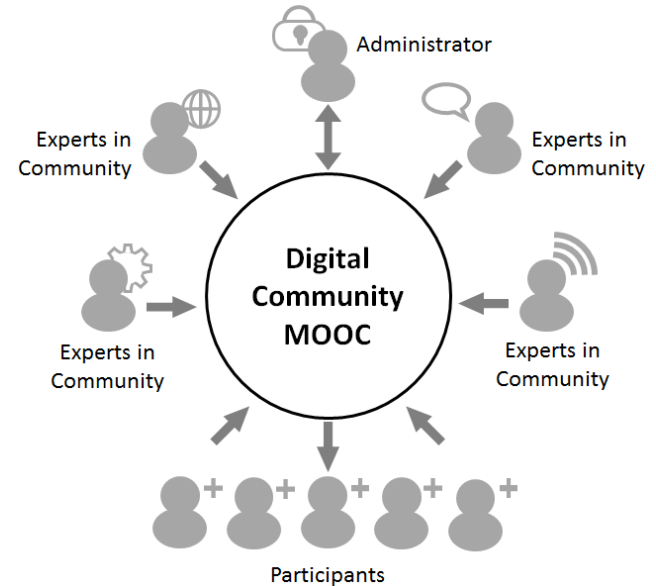The MOOC digital community ecosystem is summarised in Figure 1.

Figure 1. Environment of Digital Community in MOOC.

Refering to Figure 1, the information in digital community MOOC is provided by the experts within the communities itself. The participants will get the information, and may become the experts in the community as well should they share any information to the MOOC. The interactions between the experts and the participants are crucial, as connectivity/interactivity being the core feature of MOOC. All of the activities are administered by an administrator who normally act as the creator of MOOC.

B. Social Presence

The underlying concept for online communication, "social presence", was introduced by Short, Williams and Christie (1976), who regarded social presence as being the main element of the communications medium (cited in Kurzendoefer, 2008). The theory of social presence is documented as the perceived connectedness with others, and is identified as one of the important elements for the development of online communities (Palloff & Pratt, 2005; Rovai, 2001).

As shown in Figure 2, the categories of social presence can be divided into three main categories, which are open communication, group cohesion and personal affective. In a digital community, open communication requires other members to acknowledge the contribution of another member (Borup, West & Graham, 2011); group cohesion is the

activities done to sustain a group and to sustain the feeling of belonging within the community (Picciano, 2002; Garrison, Anderson & Archer (2003); and personal affective refers to the self-image, self-disclosure and the expression of feelings related to overall online activities (Borup, West & Graham, 2011).
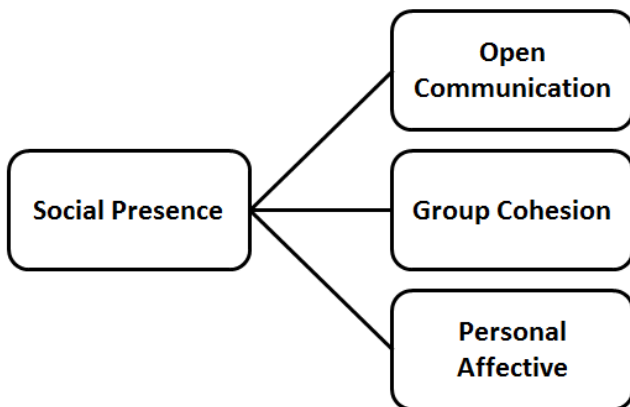

Figure 2. Categories of Social Presence.

In the online community, social presence reflects on the interactivity of participants (Garrison, Anderson & Archer, 2003). Lacked interaction will lead to a decrease in social presence, which in turn will lead to disconnected feelings among group members (Rourke, et al., 2007). When the environment is lacking in social presence, the sharing of knowledge between participants decreases (Garrison, Cleveland-Innes & Fung, 2010). Hence, social presence becomes an important element in the online community, with the challenge of conducting a suitable degree of contacts and interactions among participants (Aragon, 2003; Palloff & Pratt, 2005).

C. Personal Knowledge Management

In recent research on agent-mediated personal knowledge management (PKM), software agents can reside in the community platform to mediate the tasks on behalf of their human counterparts (Ismail & Ahmad, 2011). In the MOOC context, the human could be the experts in the community, or the facilitator. Figure 3 shows the functions of this community based MOOC such as 'follow', comment, tag, like and chat.

According to the PKM framework, the mediation of tasks to the software agents include get/retrieve knowledge, understand/analyse knowledge, share knowledge, and connect to knowledge source (Ismail & Ahmad, 2012), since software agents are capable of:

- engaging in dialogs to negotiate and coordinate (Coen, 1991);

- perceiving its environment through sensors and acting upon that environment through effectors (Russel & Norvig, 2003);

- carrying out some set of operations on behalf of a user or another program with some degree of independence or autonomy, and in so doing, employing some knowledge or representation of the user's goals or desires (Gilbert, et al., 1995);

- sensing and acting autonomously in the dynamic environment that they inhabit, and realising a set of goals or tasks for which they are designed (Maes, 1995; Ali, Shaikh & Shaikh, 2010); and

performing flexible action in an environment in order to meet its design objectives (Jennings, et al., 2000).
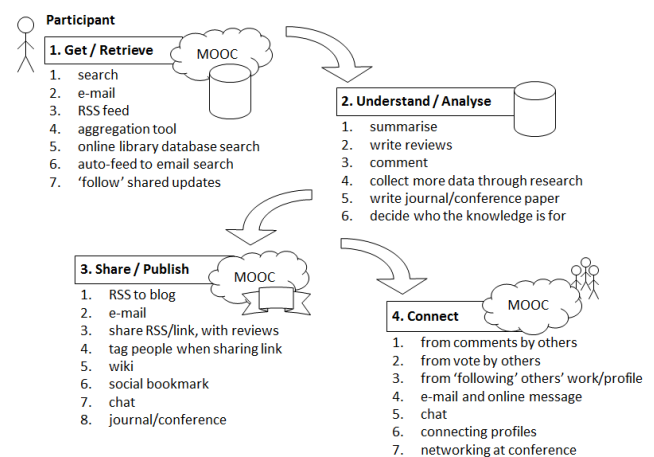

Figure 3. Overview of personal knowledge management.

III   METHODOLOGY

This research sees the opportunity of having software agents to mediate the tasks of the MOOC experts, by performing PKM processes at agent level. The research settings and design are as follows:

a) Investigate the problems and issues related to the online activities related to social presence in MOOC digital community;

b) Design reasoning algorithms: software agent and related technologies will be applied, the main algorithms that perform reasoning at different levels will be designed and scripted;

c) Develop a digital community of MOOC, focusing on state-based events and information;

d) Develop an intelligent PKM multi-agent framework for reactively and/or proactively responding to the online activities in MOOC – a framework will be developed to model basic functionalities of the multi-agent service, to accommodate the issues and limitations identified in (a) and (b);

e) Configure and test run the MOOC platform, in which selected scenarios are drawn as testing platform;

f) Validate the framework of agent-mediated PKM in MOOC, in which the entire framework will be tested in multi-agent environment via agent-based simulation.

IV PRELIMINARY FINDINGS

Software agents are said to be able to roam the Internet to find knowledge sources that indicate a person's online activities. Derived from Figure 3, Figure 4 shows the overview of this concept using nodal approach, in which the agents are assigned to reactively and proactively get/retrieve information from sources like online database, repositories and knowledge base (Ismail & Ahmad, 2011a; Ismail & Ahmad, 2011b).
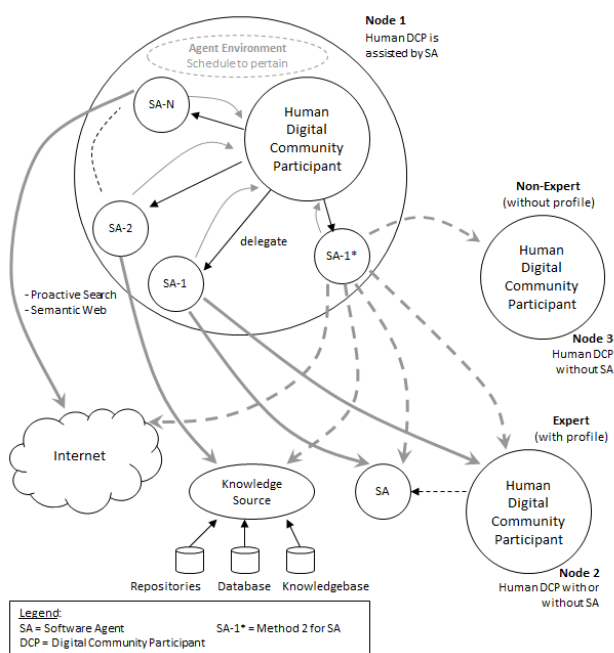

Figure 4. Multiple nodes of agents mediating personal knowledge management.

Based on Figure 4, a node, N, is specified as follows: a digital community participant, DC; all functions of the digital community, f_i, one or more agents, A_j; and all functions of agents, f_{jk}. In other words, a node is a four-tuple structure:

$$N = < DC, f_i, A_j, f_{jk} > \qquad (1)$$

where $f_i \in DC$, $f_{jk} \in A_j$, and $i, j, k \geq 1$.

In fulfilling the need to coordinate each agent's tasks at granular level, the GUSC Model is suggested by Ismail and Ahmad (2011c), postulating four main processes in PKM: get/retrieve, understand/analyse, share/publish, and connect to knowledge source. In short, the acronym "GUSC" basically means Get-Understand-Share-Connect. This model has been proven its usability in various research, including those in educational technology (Ismail, et al., 2012; Ismail, Othman & Ahmad, 2014; Ismail, Mohammad Suhaimi & Ahmad, 2013). Mapping this GUSC Model into the MOOC context, the software agents couldmediate the tasks of 'G' (get/retrieve knowledge), 'U' (understand/ analyse knowledge), 'S' (share knowledge), and 'C' (connect to knowledge source) on behalf of the human counterparts.

V DISCUSSION

Malaysia is moving towards the knowledge-based economy, and while technology is important in achieving the knowledge-based economy, the main effort lies on the society. Achieving a knowledgeable society is unlikely to be achieved through technology alone without any consideration of the social processes and institutions in which people's Internet uses are embedded (Hargittai, 2010). Hence it is important to emphasise on the social process and encourages comminication instead of focusing on the technology alone. Although the Malaysian Government has provided adequate technology infrastructure to support the digital community and knowledge-based workforce, there is a need to look at the social process within the digital community and methods to encourage participation.

MOOC mainly capitalises on the strengths that individuals participate and collaborate to bring in their experiences, knowledge and skills to the platform. From an online communication's theoretical perspective, the participation in a digital community is largely supported by 'social presence'. The absence of prompt feedback and replies in an online environment (Kaur & Sidhu, 2010) lead to the problems in terms of lacking interactions, and the feeling of loneliness and apprehension among the digital communities (Ellis & Anderson, 2011; Dzakiria & Idrus, 2003), which in turn decreases the social presence within the digital community.

When the environment is lacking in social presence, the sharing of knowledge between participants decreases and leads to disconnected feelings among group members (Garrison, Cleveland-Innes & Fung, 2010). In other words, social presence becomes an important element in the digital community, with the challenge of conducting a suitable degree of contacts and interactions among participants. Hence, there is a need for an agent-mediated personal knowledge management (PKM), where agents can reside in the MOOC environment to mediate the tasks of the expert facilitators on behalf of their human counterparts (Ismail & Ahmad, 2011a). The main purpose is to enable the digital community participate better having an 'agent' to react or respond to their status. The efficient communication in MOOC will encourage better group cohesion and thus increasing the social presence of digital community.

VI CONCLUSION

The study will be of great interest to the Ministry of Higher Education in its mission to cultivate a nation of lifelong learners. An intelligent PKM multi-agent framework is vital for the digital community to embrace lifelong learning due to its ability to increase the social presence of the community. Lifelong learning enables Malaysians not only to enrich themselves but also to develop quality knowledge workers. Moreover, the Ministry of Higher Education aims for globalised online learning via blended learning models as stated in the Malaysian Education Blueprint 2015-2025 (Ministry of Higher Education, 2015).

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